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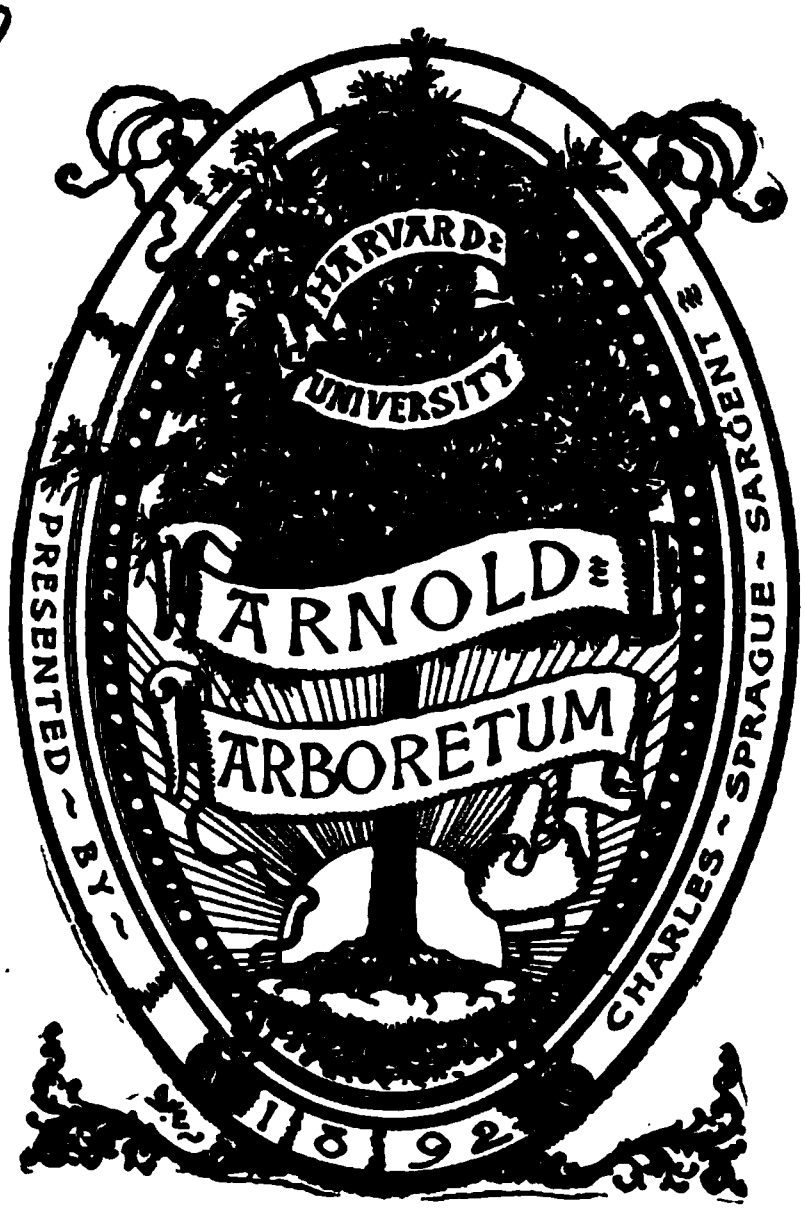
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RIBES VULGARE AND ITS INDIGENOUS REPRESENTATIVES IN EASTERN NORTH AMERICA.

M. L. Fernald.

The common Red Currant (*Ribes vulgare*) of our gardens has become well established along fence-rows, in roadside thickets, in open woods near towns, and in other places where its seeds have been easily spread, by birds and other agents, from the cultivated shrubs. In these half-wild habitats the plant has thus far shown little or no tendency to vary from the Old World type from which it was derived.

In low coniferous forests and mossy swamps and in subalpine districts of New England and eastern Canada, however, where the commonly cultivated European *Ribes vulgare* is as yet unknown, there are two indigenous red currents which have been passing as identical with or scarcely separable from the introduced plant of the gardens. These plants have several characters in common by which they are readily distinguished from the cultivated shrub. *R. vulgare* is usually upright, bearing numerous leafy tufts more or less mingled upon the old wood with the flower-bearing shoots. The blades of the mature leaves are 3.5 to 6.5 cm. broad, somewhat broadened upward, the lobes mostly short-ovate, the middle one rarely broader than long. The pedicels are mostly smooth and glandless, in one form only soft-pubescent. The rotate calyx is greenish-yellow, its oval lobes abruptly narrowed below the middle and the petals are narrowly wedge-shaped. At the base of the calyx, between the stamens and the slightly-cleft style, there is a high but narrow obtusely scalloped ring.[1]

[1] As recently shown by Professor Janczewski, two European species have been passing as *Ribes rubrum*. One, the true *R. rubrum* L., with its "*habitat in* Sueciae *borealibus*," has the calyx somewhat cup-shaped, brown or mottled with red and destitute of a disk. This species so far as known to the writer is not found wild in America. The other, *R. vulgare* Lam., with the flat calyx yellowish green and bearing a prominent disk, is the common species of cultivation. (See Edouard de Janczewski, Comp. rend. acad. franc., cxxx. 1890, 588; and Bull. Acad. Cracovie, Janvier, 1906, 3.)

In the indigenous shrubs of our northern forests and mountain-slopes the stems are decumbent or loosely straggling or reclining, often rooting freely where they touch the ground. The leafy shoots are produced chiefly from terminal buds while the numerous racemes appear below the leafy tips along the otherwise naked old wood. The blades of the mature leaves are 5 to 10 cm. broad, the sides nearly parallel, the lobes mostly broad-deltoid, the middle one usually broader than long. The pedicels are more or less covered with reddish or yellowish glands. The calyx is smoke-color or dull purplish, its segments very broadly cuneate, and the petals of similar outline. At the base of the calyx, between the stamens and the deeply-cleft style, there is a low and broad pentagonal disk.

In all their essential characters the indigenous shrubs are uniform, but while the plants of one region have the leaves bright green and glabrous or glabrate upon both surfaces, those of other localities are whitened beneath with tomentum. Whether this production of pubescence is due to peculiarities of the soil such as have been pointed out in the case of *Ribes oxyacanthoides*, var. *calcicola* [1] it is not now possible to state with certainty. It is, however, significant that the only phase of the plant known to the writer from the granitic mountains of Quebec and northern New England — Table-topped Mountain, Katahdin, the White Mountains, etc.— is the shrub with glabrous or glabrate leaves; plants from the humus of woodlands and swamps where the characteristic rock is more or less calcareous have the veins on the lower surfaces of the leaves somewhat ciliated with inconspicuous hairs — for example, specimens from low woods and Arbor-Vitae swamps in Rimouski County, Quebec, northern Maine and northern Vermont; and the shrubs which have unquestionably grown in strongly calcareous soils — specimens, for instance, from crevices of calcareous slates at Fort Kent and at Brownville, Maine — retain to maturity a soft coat of whitish tomentum. Most herbarium labels unfortunately give no information upon these points and further observations are necessary before we can state finally that the two extremes of our indigenous red current are due to local soil-conditions. Both in the field and in the herbarium the two plants are notably different in aspect, the one with quite green foliage, the other with the leaves strongly whitened beneath.

[1] Fernald, RHODORA, vii. 155 (1905).

The shrub with the leaves whitened and permanently tomentose beneath is the plant described by Pallas from northern Asia as *Ribes triste*, and later redescribed by Maximowicz as *Ribes rubrum*, γ *subglandulosum*, from Siberia, Mandshuria and the colder regions of America. The other, with the mature leaves glabrous or at most ciliate along the nerves beneath and green on both surfaces, is well matched by Michaux's material of his *R. albinervium* described from Canada ("ad amnem *Mistassin*"). The characteristics and distribution in eastern America of the smooth-fruited red currents may be briefly stated as follows:—

RIBES VULGARE Lam. Suberect shrub: leaves mostly cordate, slightly pubescent beneath or glabrate; the mature blades 3.5 to 6.5 cm. broad, broadened upwards, 3–5-lobed, the lobes mostly short-ovate: racemes spreading in anthesis, drooping in fruit, 3 to 5 (becoming 7) cm. long: the rachis glabrous, though often glandular: the pedicels mostly glandless: calyx yellow-green; its segments oval and abruptly narrowed below the middle: petals narrowly cuneate: disk between the stamens and the slightly-cleft style a high narrow ring with round-scalloped margin: fruit plump and juicy.— Encyc. iii. 47 (1789); Janczewski, Compt. rend. acad. franç., cxxx. (1890) 588, and Bull. Acad. Cracovie, Janv., 1906, 3. *R. rubrum*, var. *sativum* Reichb. Fl. Excurs. 562 (1830). *R. rubrum*, most authors, not L. Common in cultivation and frequently escaped and established in fence-rows, thickets and open woods. Naturalized from Europe.

R. TRISTE Pallas. Straggling or reclining, the branches often rooting freely: leaves somewhat heart-shaped, the mature blades 5 to 10 cm. broad, the sides nearly parallel, the lobes mostly broad-deltoid, permanently white-tomentose beneath: racemes drooping, 3.5 to 9 cm. long: pedicels mostly glandular: calyx smoke-color to purplish; the segments broadly cuneate or subrhombic, as broad as or broader than long: petals broadly cuneate: disk a low broad pentagon: style deeply cleft: fruit mostly small and hard.— Pall. in Nov. Act. Acad. Petrop. x. (1797) 378); Janczewski, Bull. Acad. Cracovie, Janv., 1906, 3. *R. rubrum* of many authors, not L. *R. rubrum*, var. *subglandulosum* Maxim. Bull. Acad. St. Petersb. xix. 261 (1874). Cold woods, swamps, and subalpine regions, Newfoundland to Alaska, south to Maine and Vermont, perhaps confined to regions of pronouncedly calcareous soil. Also in Siberia and Mandchuria.

Var. **albinervium** (Michx.) Similar, but with the leaves glabrous or sparingly pubescent beneath when young, soon glabrate. *R. albinervium* Michx. Fl. i. 110 (1803).—More common, extending south to Nova Scotia, central New Hampshire, southern Vermont, Michigan, Wisconsin, etc.

GRAY HERBARIUM.

CONNECTICUT RUBI.

WM. H. BLANCHARD.

THIS paper presents some of the facts obtained and conclusions reached by me during ten weeks spent in Connecticut searching out and studying its Rubi, more especially its blackberries. Visits of a week or more each were made in August, 1903, in July, 1904, and in June and August, 1905; and five weeks in June, July, August and September, 1906, were devoted to the work. Southington and Plainville were pretty thoroughly searched and much was done in the surrounding towns especially in Bristol, New Britain, Newington, Farmington, West Hartford, Berlin and Wethersfield. Trips were taken to New London and Norwich, Stamford, Winsted, and Somers, and numerous shorter ones were made. Mr. C. H. Bissell and Mr. Luman Andrews of Southington, Mr. W. B. Rossberg of New Britain and Dr. C. B. Graves of New London very kindly aided by visiting localities with me and exhibiting specimens.

RUBUS OCCIDENTALIS L. Black Raspberry. Abundant in all parts of the state. It probably thrives no better anywhere than in Connecticut, which is far enough south for it to be at home on the highest land. The fact does not seem to be generally known that this is a comparatively southern species and is found in Northern New England like the white oak and white pine only in favored places, occurring rarely in the high or northern parts.

R. STRIGOSUS Michx. Red Raspberry. Abundant in all parts of the state. While *R. occidentalis* is a comparatively southern plant, *R. strigosus* is a northern plant and it fruits very poorly in Connecticut.

R. NEGLECTUS Peck (*R. occidentalis* × *R. strigosus* Austin). Purple Raspberry. This occurs occasionally and is easily recognized when ripe. It may be briefly described as a red raspberry growing on a black raspberry bush. The fruit is soft and loosely held together like the red raspberry, but there is enough black mixed with the red in its color to make it purple. The cane is long and recurved and it tips as readily as the black raspberry. Careful examination shows that in all its characters it is an intergrade between *R. occidentalis* and *R. strigosus* and I have never failed to find both of them growing with or near it. It seems probable, however, that such proximity of the parent species is not without exception.

R. ODORATUS L. Flowering Raspberry. Mulberry. Occasional in most parts of the state but nowhere common. Rare in the southeastern part, frequent in some sections in the southwestern part. It seems to prefer rocky woods and thrives among the loose stones at the foot of ledges, but is sometimes seen in fence-row hedges in cleared land.

R. TRIFLORUS Richardson. Rare in some places but generally distributed. Prefers damp swampy woods.

R. CUNEIFOLIUS Pursh. This species, very distinct and agreeably constant in its characters, occurs in no other New England state. Its dwarf growth and numerous strong hooked prickles make the name "ankleberries" very appropriate. In southern New Jersey I found it called "hog blackberry." The fruit is cylindrical, large and fine-flavored. Here it is not confined to sandy soil. East of the Connecticut River it is known to occur in but one section, namely, the towns of Chatham, Colchester and Portland. West of the Connecticut River it has been found as far north as Farmington and as far east as Guilford. It seems to be occasional in some places and frequent in the southwestern quarter of the state.

R. ALLEGHANIENSIS Porter. (*R. nigrobaccus* Bailey.) Sow-teat Blackberry. This is *the* high blackberry here and is abundant nearly everywhere. No other blackberry has such a delicious, spicy, aromatic taste, and no other of all our wild berries except the strawberry approaches it in excellence. Its great number of drupelets makes it very seedy. Its long, slender, tapering shape has suggested its two most characteristic names — Sow-teat and Sheep-teat.

Odd forms of this species turn up everywhere. They seem to be local mostly. Dr. Graves very kindly took me to the station where

R. nigrobaccus, var. *Gravesii* Fernald grows. In its immediate vicinity good normal plants were seen. This variety from its yellow color, poor fruit and general sickly appearance seems to be a pathological variation. If these plants were removed to a more favorable home, it seems probable that they would soon be normal.

R. ANDREWSIANUS Blanchard. RHODORA viii. 17 (1906). Abundant near the sea, in the river valleys and on the sand plains. In these parts of the state it largely takes the place of *R. Alleghaniensis.* It is a southern species reaching its northern limits here, where it seldom bears a good crop; but in southeastern Pennsylvania, Maryland and Virginia, where it is the common high blackberry, the crop is abundant. The berries are very large and are not "seedy." Many of them are much higher than broad; they are always loose-fruited, with large "grains" or drupelets.

R. FLORICOMUS Blanchard. Am. Bot., Nov., 1905. The area on which this species is known to grow is the southeastern part of Southington and on Meriden Mountain. It is distinct enough and covers sufficient territory to make it probable that it will be found in other places.

R. FRONDOSUS BIGELOW. Probably occasional throughout the state and frequent in some places. Discussed in RHODORA, Nov., 1906. Stations found: Southington on the New Britain pipe-line, 100 rds. east of Queen St., July, 1904, a single plant; Plainville at the railroad overpass, August, 1905, a small clump; 1906, Plainville at White Oak, Southington at Shuttle Meadow, Farmington at the bridge and reservoir, West Hartford, Rocky Hill, near Norwich, and abundant on Cedar Hill near the southeast corner of Cedar Hill Cemetery in the northwest corner of Wethersfield.

R. PROCUMBENS, Muhl. (*R. Canadensis* Gray's Manual. *R. subuniflorus* Rydberg). Running Blackberry, Dewberry. Common throughout the state. This species presents numberless forms some of which resemble *R. invisus* Bailey and *R. Baileyanus* Britton, two species of dewberry whose status is uncertain at present. *R. subuniflorus* Rydberg seems to be a decumbent, depauperate form of *R. procumbens.* There is little that is constant in most of the forms of this species and what final disposition of them botanists may make is problematical.

R. RECURVANS Blanchard. RHODORA vi. 223 (1904) and viii. 152 (1906). Frequent, often abundant, in Central Connecticut and

probably found throughout. A form with thicker dark green leaves also occurs whose status is still uncertain.

Rubus Rossbergianus, n. sp. Plants glandless, pubescent, 1 to 2 feet high, stems large at the base, recurving, 3 to 5 feet long, the prostrate end often tipping; prickles of moderate size. Leaves large, dark green, rather thick, 5-foliate; leaflets broad, those on old canes remaining till fall. Inflorescence cymose, pedicels subtended by narrow leaves; flowers large; fruit short-cylindrical ½ in. high, productive.

New canes. Stems erect at first, 1 to 2 feet high, hard, green, terete, glabrous and glandless, often branched, soon recurving, becoming 3 to 5 ft. long, often tipping. Prickles ⅛ to $\frac{3}{16}$ in. long, slender, straight, strong, slanted slightly backward, numerous, 20 to the inch of stem, not noticeably in lines. Leaves large, the earlier 6 to 7 in. long by 5 to 6 in. broad, later leaves smaller, rather thick, 5-foliate, dark green with appressed hairs on the upper surface, lighter beneath and very pubescent. Leaflets broad, outline entire, long taper-pointed, finely and doubly serrate-dentate; the middle leaflet very broad and cordate, the side leaflets broad and ovate or oval, the basal leaflets broad and cuneate at the base. Petiole and petiolules large, glabrous, grooved, prickles numerous, short and hooked; the petiolule of the middle leaflet 1 in. long, the side ones one-third as long and the basal leaflets sessile.

Old canes. Stems hard, greenish brown, badly killed back, prickles intact. New growth consisting of short leafy branches mostly bearing inflorescence, one to four from each old leaf-axil, 3 to 6 in. long. Axis zigzag, slightly pubescent, prickles few, hooked. Leaves one to three, trifoliate on the main axis, and numerous unifoliate leaves above on the inflorescence making it rosette-shaped. Leaflets and unifoliate leaves mostly narrow, occasionally broad, coarsely serrate-dentate and toward the points deeply dentate; in color, texture and pubescence like those on new canes. Inflorescence cymose, axis short, about 8-flowered, the pedicels subtended by unifoliate leaves. Flowers appearing June 15 or earlier 1¼ to 1½ in. broad, petals oval, one-half as wide as long. Fruit ripening very early short-cylindric, about ½ in. high, composed of large drupelets. Edible, sweet and sought by berry-pickers. Leaves persisting till fall.

Type station: Southington, Connecticut, 25 rods southeast of the junction of Lazy Lane and Queen Street. Abundant in Southington

and the surrounding towns. Equally typical plants are abundant in Manton, Graystone and Graniteville near Providence, Rhode Island. Fairly representative plants were also seen in Canton, Lexington and Palmer, Massachusetts.

This plant can be placed with the *Recurvans* class, and in appearance it is intermediate between *R. recurvans* and *R. procumbens*. It differs from *R. recurvans* in having thicker and dark green leaves, green stems, a more prostrate habit, and the rosette-shaped collection of unifoliate leaves subtending the pedicels is very noticeable.

Mr. W. B. Rossberg, whose name is associated with this species, is a well-known local botanist of New Britain, Connecticut, who is also an enthusiastic student of local geology.

R. SETOSUS Bigelow. (*R. nigricans*, Rydberg). Frequent in moist situations, borders of swamps, ponds and streams and sometimes in dry ground. Described fully in RHODORA, Nov., 1906.

Rubus semisetosus, n. sp. Plants decumbent or erect, stems mostly round, hard, glandless, with numerous slender, often reflexed bristle-prickles; leaves on new canes 5-foliate, narrow-ovate, approaching obovate, rather long-pointed; fruit poor; flowers appearing late.

New canes. Stems decumbent or erect, 1 to 3 feet long generally terete, reddish, hard, glabrous and glandless, rarely branched. Prickles numerous, 20 to 30 to the inch of stem, the slender or bristle-shaped prickles often $\frac{3}{16}$ in. long, perpendicular to the stem or more often very retrorse. Leaves of moderate size, 3½ to 5 in. wide, 5-foliate, not thick but firm in texture, dull green and nearly glabrous on the upper surface, paler and more or less pubescent below. Leaflets oval or often appearing obovate, rather long taper-pointed, outline entire, serrate and serrate-dentate, more or less doubly; the middle one about twice as long as wide, often rounded at the base, the others much narrower and cuneate. Petiole and petiolules grooved, nearly glabrous; slender bristle-prickles weak and retrorse; petiole long; the petiolule of the middle leaflet ¾ in. long, those of the side leaflets one-third as long and the basal leaflets sessile.

Old canes. Stems mostly decumbent, often prostrate, much killed back, prickles greatly impaired. New growth consisting entirely of leafy fruit-branches 4 to 6 in. long tipped with inflorescence, one from each old leaf-axil. Axis zigzag, somewhat pubescent, bristles few. Leaves 3-foliate or rarely a few 5-foliate, few unifoliate, leaflets narrow; in color, texture and pubescence much like those on new

canes. Inflorescence a short raceme; pedicels slender, pubescent, often branched; bearing as well as the calyx a few glanded hairs or weak bristles, one or both or neither. Flowers most often appearing late, about 1 in. broad, petals long and narrow, two or three times as long as wide. Fruit poor, of a few drupelets, or sometimes maturing as fine globose berries $\frac{1}{3}$ in. in diameter.

Type station: The sand plains of Plainville and Southington, Connecticut. An abundant plant in Southern New England, growing mostly on dry ground and especially on sandy soil.

This plant is readily distinguished from *R. setosus* Bigelow into which it probably intergrades by having hard stems with comparatively few bristles and no glands, and in having the inflorescence nearly naked, the leaves, fruit and flowers on each being much alike.

Rubus ascendens, n. sp. Plants erect, 2 to 4 feet high, sometimes branched, angled; prickles numerous, rather strong; glandless or with a few glands on the inflorescence; leaves on new canes 5-foliate, often upward-turned; leaflets long-pointed, ovate or oval; flowers late; fruit small, often valuable.

New canes. Stems erect, 2 to 4 feet high, generally angled, green or reddish, hard, glabrous and glandless, often branched. Prickles numerous, 15 to 20 to the inch of stem, slender and spiny or strong bristle-prickles, often $\frac{3}{16}$ in. long with a slight backward slant. Leaves often large, 5-foliate, of firm texture, dark yellow-green and nearly glabrous on the upper surface, paler and somewhat pubescent, often quite pubescent below. Leaflets ovate or oval, often broad, long taper-pointed, outline entire, serrate or serrate-dentate; the middle one widest and rounded often cuneate at the base, the others narrower and cuneate. Petiole and petiolules large, grooved, slightly pubescent with slender retrorse prickles, the petiolule of the middle leaflet about $\frac{3}{4}$ in. long, the side leaflets short-stalked and the basal ones sessile.

Old canes. Stems green or green-red, prickles little impaired. New growth consisting of leafy fruit branches, 4 to 12 in. long generally one from each old leaf-axil. Axis of branch zigzag, slender, weakly armed, nearly glabrous. Leaves 3-foliate below, the upper unifoliate; leaflets wide or narrow, in color, texture and pubescence like those on new canes. Inflorescence a short raceme; pedicels slender, pubescent, otherwise naked or on many plants clothed with more or less weak bristles or glanded hairs one or both, with or without subtending unifoliate leaves or bracts. Flowers appearing rather

late, 1 in. broad or often broader, petals narrow, twice as long as wide. Fruit very variable, often consisting of a few drupelets, frequently bearing profuse edible fruit, which is globose, ⅜ in. or over in diameter.

Type station: Southington, Connecticut, twenty rods west of the railroad bridge over the Qunnipiac River near the Plainville line. Abundant in Southington, Bristol, Plainville and neighboring towns and in Southern New England generally.

This species is intended to include not only the plants which closely resemble the type, but also many others which cannot be placed with any species yet described. They are too large, strong, erect, and fruitful as well as too strongly armed to be placed with *R. semisetosus*. These characters and the general appearance of the new canes indicate the relationship of these plants to the high blackberries especially to small forms of *R. Andrewsianus*.

R. HISPIDUS L. Common. The delicate forms predominate, though some peculiar ones occur. A careful examination would probably lead to the discovery of a great number.

Most of the Connecticut Rubi are included in the above enumeration but in nearly all localities odd forms are to be found that cannot easily be placed. Many of them seem to have no second station. Of the peculiar tall forms some have considerable resemblance to *R. Canadensis* L. and *R. pergratus* Blanchard but both of these species are rare so far as known, though there are considerable areas in the northeastern and northwestern parts of the state which botanists have examined but little where the plants in question may occur in greater number and be nearer normal.

WESTMINSTER, VERMONT.

NOTES ON CONNECTICUT PLANTS.— *Phaseolus perennis*, Walt. This species, which was lost sight of by our Connecticut botanists for many years, has been reported in recent volumes of RHODORA from three stations in the southwestern section of the state. Two of these stations are near the borders of salt marshes, while the third is adjacent to a "scarcely brackish" marsh. A new station, discovered by me Sept. 28, 1906, in the town of Franklin, is of interest as showing the species growing under different conditions, and also as extending its range sixty miles farther toward the east. This station is twenty

miles inland from Long Island Sound, and just below the brow of a hill which rises to an elevation of five hundred feet above the sea level. Here in a sheltered, sunny location, along the base of a low cliff, the plant has found a congenial home and exhibits great vigor of growth, many of the racemes being fifteen inches in length. The station follows the line of the cliff for several rods.

Hierochloe borealis, Roem. & Schultes. In Connecticut this is essentially a species of the coast, and it is seldom found elsewhere. It occurs, however, in several bogs and meadows in Franklin, and it is abundant in one of them. These stations are noteworthy from being twenty miles back from the coast, in a typical hill town. Specimens gathered here do not differ noticeably from those collected in saline situations. In RHODORA vi. 104, this species is reported from Willoughby, Vermont, where it is said to be rare.

Eatonia Dudleyi, Vasey. This species appears to be better represented in southern Connecticut than has been supposed to be the case. In RHODORA vii. 68, I called attention to its frequent occurrence about New Haven. It is equally frequent in southeastern Connecticut. On several tramps last June through Franklin and adjacent towns, I found it in nearly every locality where one would naturally look for *Eatonia*, and it was often the prevailing species of this genus. It is not wholly confined to woodlands, for it grows in profusion in one place beside the New London Northern Railroad, where there is absolutely no shade, the trees having been cut away several years ago. The plants at this station are robust and very pubescent.

Cuscuta compacta, Juss. This species grows along all the principal streams of Franklin, and is by no means rare here.— R. W. WOODWARD, New Haven, Connecticut.

NEWLY OBSERVED STATIONS FOR MASSACHUSETTS PLANTS.

C. H. KNOWLTON.

DURING the past season I have made many botanical excursions in various directions from Boston, with some very interesting results. Messrs. William P. Rich and H. A. Purdie have been my companions on several of these trips, and the plants mentioned below are all represented by specimens in my herbarium, while many are also in

the herbarium of Mr. Rich. The following plants seem particularly worthy of mention:

Eragrostis minor, Host. This introduced grass is very abundant in the crevices and along the inner edge of the sidewalk, on Chandler Street, Boston, near Castle Square. I also collected it on the Centralville dump in Lowell, in 1902.

Allium tricoccum, Ait. I discovered the foliage of this plant in May, 1906, in rich moist woods by Clematis brook, Waltham, near *Asplenium acrostichoides*, Sw. When I revisited the station on July 7 the leaves had withered and the flower-buds were beginning to open. There were hundreds of plants, and the large round heads of white blossoms were very conspicuous. The plant has also been collected in the neighboring Beaver Brook Reservation, by Mr. R. A. Ware.

Allium vineale, L. I found a few plants of this species in the edge of a cultivated field on Rag Rock, Woburn. It is to be hoped that this pest will not prosper here, but remain an unusual plant.

Quercus Prinus, L. A few trees grow in sandy soil on the shore of Little Quittacas Pond in Lakeville. It is very abundant in Sutton, Worcester county, where it is the predominant tree in the woods around Purgatory Chasm. It is also frequent in Webster and Dudley, but I have not seen it near Boston.

Celtis occidentalis, L. Several trees grow in a pasture in Waltham, near Waverley. I found them first before the leaves came out, and visited them again the last of May, just as they were going out of blossom. The leaves and twigs seemed much diseased from the work of insect parasites. Small trees in better condition grow on Mt. Tabor in Lincoln (*C. H. Knowlton and E. L. Shaw*).

Nasturtium sylvestre, R. Br. This rare crucifer is very plentiful around a green-house in Natick, where it seems thoroughly established.

Potentilla fruticosa. L. One bush I have seen in a grassy swamp in Woburn, another larger in a similar place in Amesbury. In the northern part of Groton it grows in great profusion. This station was given by Mr. C. W. Jenks in the Middlesex Flora.

Amphicarpaea Pitcheri, T. & G. I found this growing in considerable abundance at Oak Island, Revere, where it was collected by Mr. Rich in 1893. (RHODORA, i. 27.) In general appearance as well as in several minor details it is distinctly different from the common species. Later in the season it was found by Mr. H. H. Bartlett in great abundance on Horn Pond Mt. in Woburn, only a mile or two from Mr.

Rich's original station in Winchester. Mr. M. L. Fernald also reports it from Rhode Island. (RHODORA, viii. 221).

Apios tuberosa, Moench. Mr. Rich and I found very many fine fruiting specimens of this common plant along the shores of Lake Monponsett, Halifax. Its usual mode of reproduction seems to be by rootstocks and tubers.

Desmodium cuspidatum, T. & G. In open woods, Horn Pond Mt., Woburn; also in moist oak woods, Natick.

Desmodium sessilifolium, T. & G. This plant, occasional in Connecticut and Rhode Island, was first reported in Massachusetts from Middleboro by William Boott (1870), and from Lakeville in 1871. The Lakeville station was visited in 1899 by members of the New England Botanical Club, and again this year by Mr. Rich and myself. The plant is still abundant at this place, along the dry sandy roadside near Lake Assawompsett. We also found a clump of very large specimens in an old orchard two or three miles away, and a large quantity further south, along the causeway between Little and Great Quittacas ponds, in Rochester. The fruit of this species sticks even closer than that of the common kinds, and further search would probably show that the plant is well distributed over this flat sandy region, where it finds its northeastern limit. Mr. John Murdoch, Jr. tells me it is still abundant at Middleboro.

Ilex opaca, Ait. A few good trees grow in the woods at Halifax, but no fruiting specimens were observed.

Viola arenaria, DC. I found an abundance of this in a dry clearing in Ashburnham, Worcester county. I have never seen it in the Boston region.

Viola sagittata, Ait. Abundant in moist sandy field, Kendal Green, Weston. Also in a similar situation near Cambridge reservoir, Lincoln. (*C. H. Knowlton and E. L. Shaw.*)

Aralia trifolia, Dec. & Planch. Moist woods, Burlington. Tophet Swamp, Lexington.

Hydrocotyle umbellata, L. This plant, so abundant on Cape Cod, seems even more plentiful in the northern part of Plymouth county. Messrs. Rich, Purdie and I found the submersed form in abundance at Indian Head Pond, Hanson. In Lakeville, at Little Quittacas Pond, where the water had been drawn off we found a belt some three rods wide of the terrestrial form, nearly surrounding the pond. The rootstocks formed an interlacing network, and one shore had

been plowed for nearly half a mile to destroy this plant and the few others which grew with it.

Chiogenes serpyllifolia, Salisb. A small station in the Hanson cedar swamp. (*C. H. Knowlton and R. A. Ware*).

Leucothoe racemosa, Gray. I have found one bush by the Charles River in Natick. It is abundant in wet woods at Halifax.

Hottonia inflata, Ell. The latter part of June Mr. J. W. Huntington of Amesbury showed me the station for this plant which he reported in RHODORA, iii. 216. July 7 I found a few plants in a small brook in Waltham, and the next day I came across large quantities in the ditch beside the Willow Road, Belmont.

Lysimachia producta, Fernald. There is a fine colony of this on the sandy shore of Silver Lake, Halifax.

Sabbatia chloroides, L. Large quantities of this in Halifax bring the plant a little nearer to Boston than previous reports.

Asclepias obtusifolia, Mx. This plant, reported "not common" in the Middlesex Flora, is frequent in the towns of Chelmsford, Westford, Dunstable, Groton and Tyngsboro, where the light glacial gravel favors it.

Echinospermum Lappula, L. Abundant in roadside thicket, Groton; roadside, Winchester.

Linaria genistaefolia, Mill. I found a single plant of this rare waif, in good fruit and flower, on a railroad embankment in Groton. I do not know of any other station in New England.

Scrophularia leporella, Bicknell. I discovered a large clump of this well fruited, growing alone in a dry pasture at East Lexington, August 4.

Scrophularia Marilandica, L. There is a fine station for this on Concord Hill, Lexington, from which I collected good fruiting specimens Oct. 13. It was found here as early as 1903 by Miss E. L. Shaw. This place and Oak Island are the only stations known for it in the Boston region.

Galium boreale, L. I found some fine plants of this by a ditch in a mowing field, near Central Square, Woburn. It grew with all the assurance of a native, and there was no evidence of its being a garden escape.

Bidens comosa (Gray) Wiegand. Wet roadside, Warren, Worcester county.

Matricaria discoidea, DC. I found a fine specimen of this in

Winchester early in the summer. Mr. F. G. Floyd has also a station for this peculiar-smelling "pineapple weed" in West Roxbury.

Solidago sempervirens, L. Abundant in an open grassy swamp in Winchester, at an elevation of about 200 feet. I have also collected it on the East Lexington meadows.

Boston, Massachusetts.

THE VARIATIONS OF PRIMULA FARINOSA IN NORTHEASTERN AMERICA.

M. L. Fernald.

Primula farinosa in its broad sense is a plant of very wide range, the typical form occurring in northern and mountainous districts of Eurasia and North America,while some representative of the species is found in nearly all cooler parts of the globe, even in Antarctic South America. The plant of eastern North America is very generally called true *P. farinosa*, and in Engler's Pflanzenreich nearly all the American plants are united by Pax and Knuth with the Eurasian plant as *P. farinosa*, subsp. *eufarinosa* Pax, var. *genuina* Pax.[1] As shown in the Gray Herbarium, however, there is very little American material which is clearly identical with the Eurasian type of *P. farinosa*. Instead, most of the material from the northeastern United States and adjacent British America is of two seemingly endemic varieties, while in the Rocky Mountains is a third which may be looked for with some confidence on the mountains of eastern Quebec. These three varieties and the Eurasian type of the species may be distinguished as follows.

* Calyx in anthesis 3–5 mm. long; involucral bracts 3.5–6 mm. long.

P. farinosa L. Low, rarely 3 dm. high: leaves oblanceolate to narrowly obovate, *white-farinose* beneath: bracts lance-attenuate: *pedicels rarely equalling the calyx*: capsule 6–8 mm. long, slightly exserted.— Sp. i. 143 (1753).— Eurasia. Rare in America: examined only from Labrador and Newfoundland.

Var. americana Torr. Scape 1–2.5 dm. high: leaves oblanceolate

[1] Pax & Knuth in Engler, Pflanzenr, iv. Fam. 227, 83 (1905).

or spatulate, rather stiff, covered beneath with *sulphur-yellow* powder: bracts as in the species: *pedicels elongate*, often 2 to 5 times as long as the calyx: capsule 5–8 mm. long, much exserted.— Fl. i. 213 (1824). — Shores of Lakes Huron and Michigan, Ontario and Michigan.

* * Calyx in anthesis 6–8 mm. long: bracts 6–11 mm. long.

Var. **macropoda**, var. nov. Planta 1–4.5 dm. alta; foliis spathulatis vel anguste rhomboideo-ovatis longe petiolatis, subtus farinosis; bracteis lineari- vel lanceolato-attenuatis; pedicellis elongatis (1–5 cm. longis); capsulis 9–12 mm. longis exsertis.

Usually tall (1–4.5 dm. high): leaves from spatulate to narrowly rhombic-ovate, long-petioled, usually white-farinose beneath: bracts linear- or lance-attenuate, often involute in drying: pedicels mostly elongate (1–5 cm. long): capsule 9–12 mm. long, usually much exserted.—LABRADOR, Battle Harbor, July 18, 1891 (Bowdoin College Exped. no. 104): QUEBEC, Island of Anticosti (Pursh); wet limestone cliffs, Percé, August 17, 1904 (*Collins, Fernald and Pease*); banks of the St. Lawrence R., Matane, August 7, 1904 (*F. F. Forbes*); limestone cliffs and ledges, Bic, July 16, 1904 (*Collins & Fernald*), July 6–10, 1905 (*Williams, Collins and Fernald*), July 5, 1906 (*Fernald & Collins*, no. 243 — TYPE): NOVA SCOTIA, without locality (MacCulloch); dripping cliffs, Baxter's Harbor, July 10, 1900 (*F. G. Floyd*): MAINE, Mt. Kineo, August, 1866 (*A. H. Smith*), September 27, 1887 (*G. G. Kennedy*): KEEWATIN, a small green-leaved extreme, below high-water mark, shore of Hudson Bay, latitude 56°, August, 1886 (*J. M. Macoun*): SASKATCHEWAN, Carleton House (*Richardson*): ATHABASCA, "The Cascade," Athabasca R., June 15, 1892 (*Elizabeth Taylor*, no. 38): MACKENZIE, Great Slave Lake (*Richardson*).

Var. **incana** (M. E. Jones), n. comb. Scapes 1–3.5 dm. high: leaves oblong- to narrowly rhombic-ovate, short-petioled or subsessile: bracts linear-lanceolate, obtuse or acutish: pedicels in anthesis mostly shorter than the bracts, in fruit slightly elongated (rarely 2 or 3 cm. long).— *P. incana* M. E. Jones, Proc. Cal. Acad., Ser. 2, v. 706 (1895). *P. americana* Rydberg, Bull. Torr. Cl. xxviii. 500 (1906).— Rocky Mts., Alberta to Colorado and Utah.

GRAY HERBARIUM.

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NOTES ON MUHLENBERGIA.

F. Lamson-Scribner.

A critical study of eastern species of *Muhlenbergia* as represented by the material in the National Herbarium, has led to a somewhat new classification of the species heretofore recognized and the segregation of several subspecies and one new species. The results of this study are here presented.

Section 1. Glumes minute, the first sometimes obsolete. *Muhlenbergia* proper.

1. Muhlenbergia Schreberi Gmel. Syst. Nat. **2**: 171. 1791. *M. diffusa* Willd. Enum. **1**: 81. 1809; Schreb. Gram. **2**: 143. Pl. 51. 1810.

1a. Muhlenbergia Schreberi **curtisetosa** Scribn. n. subsp. Panicles 3–12 cm. long; spikelets 2.5–3 mm. long; glumes unequal, the first ovate, obtuse, about 1 mm. long, the second ovate or ovate-lanceolate, obtuse, acute or abruptly mucronate-pointed, 1–2 mm. long; lemmas short-awned; awns 1 mm. or less in length. Type collected by J. Wolf in Illinois in 1881. Other specimens in the Natl. Herb.; Illinois, *J. Wolf*, 1882, Champaign, Illinois, *G. P. Clinton*, 1892. No. 204 *A. Commons* from Centerville, Delaware, apparently belongs here.

1b. Muhlenbergia Schreberi **palustris** Scribn. n. comb. *Muhlenbergia palustris* Scribn. U. S. Dept. Agric. Div. Agros. Bul. **11**: 47. 1898. Culms filiform; sheaths naked at the throat; both glumes manifest; awns 5–6 mm. long. Swamps, Brightwood, District of Columbia (Type locality).

Section 2. Glumes ovate, acute, much shorter than the lemmas. (*Stenocladium* Trin. Fund. Agros. 117, as a section of *Trichochloa*.)

2. Muhlenbergia sobolifera (Muhl.) Trin. Gram. Unifl. 189.

Pl. 5, fig. 4. 1824. *Agrostis sobolifera* Muhl. in Willd. Enum. 95. 1809. *Trichochloa sobolifera* Trin. l. c.

2a. MUHLENBERGIA SOBOLIFERA **setigera** Scribn. n. subsp. Culms very slender, much branched; lemmas awned; awns 1–3 mm. long. Otherwise as in the species. Type, no. 70 *J. Reverchon*, Texas, in Natl. Herb. No. 1054 *J. Reverchon* in Natl. Herb., also from Texas, belongs here.

3. MUHLENBERGIA TENUIFLORA (Willd.) B. S. P. Prelim. Cat. Pl. N. Y. 67. 1888. *Agrostis tenuiflora* Willd. Sp. Pl. **1**: 364. 1797. *Muhlenbergia Willdenowii* Trin. Gram. Unifl. 188. 1824. *Trichochloa longiseta* Trin. Fund. Agros. 117. 1820.

3a. MUHLENBERGIA TENUIFLORA **variabilis** Scribn. n. subsp. Culms smooth at the nodes, much branched above; panicles linear, strict, erect, more rigid than in the species; spikelets 4 mm. long; lemmas mucronate or short-awned; awns 2–3 mm. long. Type, no. 654a *Biltmore Herbarium* from Chimney Mountain, Rutherford, North Carolina, distributed as *Muhlenbergia sobolifera*.

SECTION 3. Glumes narrow, acuminate or aristate, nearly as long as or exceeding the lemmas in length. (*Acroxis* Trin. Fund. Agros. 117, as a section of *Trichochloa*.)

4. MUHLENBERGIA MEXICANA (Linn.) Trin. Gram. Unifl. 189. 1824. *Agrostris mexicana* Linn. Mant. **1**: 31. 1767. *Trichochloa mexicana* Trin. Fund. Agros. 117. 1820. *Muhlenbergia polystachya* Mac. & Bush. Trans. Acad. Sci. St. Louis, **12**: 79. Pl. 12. 1902. *Agrostis lateriflora* Michx. Flor. Bor. Am. **1**: 53. 1803. Culms diffusely branched throughout from the base; panicles numerous, 3–10 (usually about 6) cm. long, oblong-ovoid or subpyramidal, rarely linear, the base usually enclosed within the subtending leaf-sheath.

4a. MUHLENBERGIA MEXICANA **commutata** Scribn. n. subsp. Lemmas awned; awns 4–10 mm. long. Otherwise as in the species. (*M. sylvatica*, in part of authors.) Quite distinct from *Agrostis sylvatica* Torr. upon which *Muhlenbergia sylvatica* was based. Specimens in Natl. Herb.: no. 171 *M. L. Fernald*, 1893 and nos. 528, 1894 and 522, 1896, all from Maine; no. 80 *Wm. Harriot*, 1901, from Ontario and no. 26,245 *J. Macoun*, 1901, from the same region. Other specimens from New York, Delaware, Pennsylvania, Illinois and Minnesota. The specimens from Delaware (no. 206 *A. Commons*) have aristate glumes

equalling or slightly exceeding the florets and awns of the latter 6–10 mm. long. An exact counterpart of this form, but awnless and placed under the species, was collected by C. R. Ball at Athens, Illinois, in 1892. The specimens from Pennsylvania (coll. by T. C. Porter, 1895), with rather loose subpyramidal panicles are exactly represented by awnless specimens collected in Illinois by J. Wolf in 1892. The latter are referred to the species.

5. MUHLENBERGIA FOLIOSA Trin. Gram. Unifl. 190. 1824. *Trichochloa foliosa* Trin. Fund. Agros. 117. 1820. *Agrostis foliosa* R. & S. Syst. **2**: 373. 1817. *Agrostis filiformis* Willd. Enum. Hort. Berol. **1**: 95. 1809, not Sprengel 1807. *Agrostis filiformis* Muhl.! Gram. 66. 1817. *A. lateriflora filiformis* Torr. Fl. **1**: 66. 1824. *Muhlenbergia mexicana filiformis* Scribn. Mem. Torr. Bot. Club. **5**: 36. 1894. *Muhlenbergia mexicana* of authors in part. Culms branched above rarely to the base, branches elongated; panicles 5–15 cm. long; narrowly lanceolate to filiform, long-exserted, densely flowered, more or less interrupted especially towards the base.

The type of Muhlenberg's *Agrostis filiformis* is in his herbarium, deposited in the Academy of Natural Sciences of Philadelphia, and is the species here referred to *Muhlenbergia foliosa* Trin. assuming that it is identical with the *Agrostis filiformis* of Willdenow upon which *M. foliosa* was founded. Both Willdenow and Muhlenberg note the close affinity of this species with *M. mexicana* and Trinius in his later writings (Trans. St. Petersb. Acad. VI, **6**^{2}: 278. 1841) refers *M. foliosa* to that species. The habit of the plant and especially the fewer much exserted and more elongated panicles and more densely flowered panicle-branches serve to distinguish the species as here classified. *Agrostis frondosa* Poir. Encycl. Suppl. **1**: 252. 1810, was considered by Roemer & Schultes as identical with *Agrostis filiformis* Willd. The identity of Poiret's species is now doubtful; he says of it that it grows in Germany and resembles *Agrostis mexicana* Linn. in its inflorescence.

Among the specimens in the National Herbarium referred to *Muhlenbergia foliosa* are the following: nos. 524, 526 and 529 *M. L. Fernald*, from Maine, no. 68 *H. B. Dorner* from Indiana; no. 794 *E. A. Mearns* from Minnesota; nos. 1686, 1756, 1764, 1704, and 2848 *P. A. Rydberg* from Nebraska; no. 521 *David Griffiths* from

Wyoming; no. 359 *O. B. Metcalfe* from New Mexico; nos. 26,248, 26,247 and 26,246 *J. Macoun* from Ontario.

5a. MUHLENBERGIA FOLIOSA **ambigua** Scribn. n. comb. *Muhlenbergia ambigua* Torr. in Nicollet's Rept. 164(237). 1843. *M. sylvatica* Auct. in part. Lemmas awned; awns 4–10 mm. long. Otherwise as in the species.

A specimen of the type collection of *Muhlenbergia ambigua* is in the National Herbarium. Other specimens referred here are no. 26,244 *J. Macoun*; no. 80 *Wm. Harriot*; no. 525 *M. L. Fernald*, 1893; no. 527 *M. L. Fernald*, 1894. A specimen from Delaware, collected by A. Commons in 1897, has panicles rather more closely flowered and more rigid than usual. An awnless counterpart of this form was collected by C. R. Ball in Ohio in 1892. The presence of a more or less developed second floret noted in the original diagnosis of *M. ambigua*, occurs in other species of this group.

5b. MUHLENBERGIA FOLIOSA **setiglumis** Scribn. n. comb. *M. sylvatica setiglumis* S. Wats. U. S. Geol. Expl. Exped. 40th Par. **5**: 378. 1871. "Glumes attenuate into a scabrous bristle 2½–3 lin. long; the palet with its awn about twice longer" (S. Wats. l. c.). The habit of this subspecies is entirely that of *Muhlenbergia foliosa* and the plant differs from *M. foliosa ambigua* only in the awn-like prolongation of the glumes beyond the floret as in *M. racemosa*. A specimen from the type collection is in the National Herbarium, no. 1,288 *S. Watson*, from near Warm Springs, Humboldt Pass, Nevada. To this subspecies are referred no. 2,838 *T. A. Williams* from Wyoming; no. 3 *Williams* from South Dakota; no. 927 *Griffiths & Morris* from Oregon and no. 2 *F. P. Briggs* from Bradley, Maine, In Briggs' specimen the glumes equal or much exceed the florets in different spikelets in the same panicle.

6. **Muhlenbergia umbrosa** Scribn. n. nom. *Agrostis sylvatica* Torr. Fl. U. S. **1**: 87. 1824, not Linn. 1762. *Agrostis diffusa* Muhl. Gram. 64. 1817, not Host 1809. *Muhlenbergia sylvatica gracilis* Scribn. Trans. Kans. Acad. Sci. **9**: 116. 1885, not *M. gracilis* Kunth 1829.

Muhlenbergia sylvatica Torr. & Gray was based upon *Agrostis sylvatica* Torrey, who changed the name from *Agrostis diffusa* Muhl. because of an earlier *Agrostis diffusa* by Host, apparently overlooking the much earlier *Agrostis sylvatica* of Linnaeus. There being no

other name available for this very well defined species a new one, *M. umbrosa*, is here proposed.

Torrey thus describes the species closely following Muhlenberg in his diagnosis of *Agrostis diffusa* "Culms erect, much branched, diffuse, smooth; stipules lacerate panicle filiform; corolla longer than the calyx; awns three times as long as the flower." Torrey compares the species with *M. tenuiflora* from which he says it differs "in being much branched and diffuse, the glumes are also longer and narrower and the culms are glabrous at the nodes."

The type of this species is in Muhlenberg's herbarium in the Academy of Natural Sciences of Philadelphia. It has much branched culms with numerous filiform panicles and long-awned spikelets. No. 205 *A. Commons* from Delaware and no. 461 *B. Fink* from Iowa, both in the Natl. Herbarium are identical with the type. The general aspect of the species is unlike that of either *M. foliosa ambigua* or *M. mexicana commutata*, both of which have heretofore been referred to *M. sylvatica* by authors. The panicles are more slender, the spikelets are less crowded and are usually pale green or straw-colored, never violet or purplish as is usual in those subspecies.

6a. MUHLENBERGIA UMBROSA **attenuata** Scribn. n. subsp. Lemmas awnless or merely mucronate-pointed. Otherwise as in the species. Type, no. 25 *E. N. Wilcox* from Aurora Co., South Dakota. No. 27 *J. H. Kellogg* from Missouri; no. 8096 *E. S. Steele* from the District of Columbia; no. 523 *M. L. Fernald* from Maine, belong here. The subspecies ranges from Maine to Dakota and Nebraska southward to Missouri and Kansas.

A very careful study of the abundant material classified under *Muhlenbergia mexicana* and *M. sylvatica* in the National Herbarium, has led to the interesting conclusion that both these species present awned and awnless forms and that the true *M. sylvatica* should be limited to the *Agrostis diffusa* of Muhlenberg, a well marked species quite distinct from awned forms of *M. mexicana* or of the restored *M. foliosa* of Trinius. In the case of these latter species it was found that every slight variation in habit in plants with awnless spikelets could be exactly matched by awned specimens, the presence of the awn being the only difference whatever. The natural conclusion is that the awnless and awned plants belong to the same species and that at best the latter (those with awned spikelets) could only be treated as subspecies of the former. It appears also, that *Muhlen-*

bergia Schreberi, *M. tenuiflora* and *M. umbrosa*, all awned species, present forms in which the awns are very much reduced and that in the awnless *M. sobolifera* an awned form occurs. The importance of the awn as a character for diagnosis in this group of species has apparently been much overestimated.

7. MUHLENBERGIA RACEMOSA (Michx.) B. S. P. Prelim. Cat. Pl. N. Y. 67. 1888. *Agrostis racemosa* Michx. Fl. **1**: 53. 1803. *Agrostis setosa* Muhl. Gram. 68. 1817. *Trichochloa glomerata* Trin. Fund. Agros. 117. 1820. *Muhlenbergia glomerata* Trin. Gram. Unifl. 191. 1824. This well known species ranges from Newfoundland to Washington and British Columbia and southward in the east to North Carolina and in the west to Texas (?), New Mexico and Arizona.

7a. MUHLENBERGIA RACEMOSA RAMOSA (Vasey) Beal. Grasses N. Am. **2**: 253. 1896. *M. glomerata ramosa* Vasey Cat. Grasses U. S. 40. 1885. "A much branched spreading form, Illinois to Colorado and Montana" (Vasey l. c.). "Stout, much branched below, very leafy. Prairie regions." (Vasey Contrib. U. S. Natl. Herb. **3**: 68. 1892.) No. 397 *Griffiths* from South Dakota, no. 405 *B. F. Bush* from Missouri, no. 2853 *F. Clements* from Nebraska and no. 265 *B. B. Smyth* from Kansas belong here. This is the common form in the prairie regions of the west.

7b. MUHLENBERGIA RACEMOSA **violacea** Scribn. n. subsp. characterized by its slender simple culms usually violet or dark purple and more or less interrupted panicles, abruptly aristate glumes and comparatively small spikelets. Type from North Hannibal, New York, collected by *O. E. Pearce* 1883 without number. No. 748 *E. H. Mearns* from Minnesota belongs here. This subspecies is less well defined than the last. It is apparently common in the north growing usually in bogs.

8. **Muhlenbergia glabrifloris** Scribn. n. sp. A slender branching glabrous perennial 4–6 dm. high, from scaly rootstocks, with flat erect or ascending leaves, slender strict panicles and awnless spikelets 2.5–3 mm. long. Culms terete, very minutely scabrous for a short distance below the nodes, soboliferous at the base; sheaths somewhat compressed, smooth, mostly shorter than the internodes, crowded on the branches, naked at the throat; ligule very short, 1 mm. or less long, minutely ciliate on the edge; leaf-blades 2–10 cm. long, 1–4 mm. wide, acute, very minutely scabrous

along the margins and nerves; panicles simple, 2–6 cm. long, occasionally somewhat glomerate, the closely flowered short branches appressed, usually partly enclosed in the subtending leaf-sheath; pedicels scabrous, usually much shorter than the spikelets; spikelets ovate-lanceolate; glumes lanceolate, acute or acuminate-pointed, subequal, a little shorter than, as long as, or a little longer than the floret, scabrous on the keel excepting near the base; lemmas ovate or oblong, obtuse or submucronate-pointed, scabrous on the keel and lateral nerves above, otherwise smooth, no hairs at the base; palea ovate-oblong, obtuse, equalling or a little shorter than the lemmas.

Type, no. 5 *J. Reverchon*, from Texas in the National Herbarium. Other specimens are from Illinois, *J. Wolf* and *E. Hall*. Hall's specimen is presumably from Athens in 1868 and was first referred to *M. sylvatica* by Vasey, who later regarded it as a doubtful variety of *M. mexicana*. The culms are branching throughout and the numerous small panicles terminating the branches and partly included in the subtending leaf-sheaths present the habit of *M. mexicana*, but the plant is more slender throughout especially in its panicles, the texture of the glumes and lemmas is much softer and the latter are perfectly smooth at the base there being no hairs either upon the callus or on the body of the lemma. The spikelets are rather those of a *Sporobolus* than a *Muhlenbergia* but the plant evidently belongs with the soboliferous species of the latter.

Bureau of Plant Industry,
U. S. Department of Agriculture,
Washington, D. C.

THE ALPINE RHINANTHUS OF QUEBEC AND NEW HAMPSHIRE.

M. L. Fernald.

The plants which have long passed in eastern America as *Rhinanthus Crista-galli* L., in part (*R. minor* Ehrh.), occupy two strikingly different geographic areas. One, apparently the true *R. Crista-galli* (*R. minor*), abounds in sterile fields and meadows, and along road-

sides and borders of thickets in eastern Quebec and Newfoundland, chiefly near the coast, and extends thence southward along the New England coast. The other has long been known in alpine regions of the White Mountains, and in 1881 it was collected by Mr. John A. Allen upon Table-topped Mountain in Gaspé Co., Quebec.

The writer has long felt that the plant of Oakes Gulf and the Alpine Garden in the White Mountains and of Table-topped Mountain in Gaspé should not be regarded as identical with the coastal *Rhinanthus Crista-galli*, but not until the past summer has he had an opportunity to test his convictions by study in the field of the alpine plant. In August last, however, this Rhinanthus was found in profusion on cool boggy meadows and open slopes at altitudes varying from 950 to 1125 meters, on Table-topped Mountain. It was most abundant in meadows, where it was associated with *Phleum alpinum*, *Deschampsia atropurpuresa*, *Juncu castaneus*, *Salix vestita*, *S. argyrocarpa*, *Rubus arcticus*, *Pyrola grandiflora*, *Veronica alpina*, var. *unalaschcensis*, *Castilleja pallida*, var. *septentrionalis*, *Gnaphalium norvegicum*, and other arctic-alpine species, with some of which it occurs in the White Mountains. Abundant flowering and fruiting material was secured, and notes were made from the fresh plant, which, upon the return to the shores of the lower St. Lawrence, showed that the alpine Rhinanthus is clearly distinct from the common coastal *R. Crista-galli*. A detailed study of this and of the other species of *Rhinanthus* of America and of northern Europe, as recently defined in the works of Chabert, Sterneck, and others, shows, furthermore, that the plant of the White Mountains and of Table-topped Mountain is apparently an undescribed species, and that it occurs also on the coast of Labrador. This plant, from the characteristic outline of the cauline leaves may be called

RHINANTHUS **oblongifolius**, n. sp. Planta 0.6–4 dm. alta viridis basi glabra superne ad internodiorum latera pilosa simplex; foliis caulinis quam internodia brevioribus oblongis vel in speciminibus minoribus linearibus scabridis obtusis crenato-dentatis, dentibus latis appressis; spicis 2–12-floris; bracteis scabris, infimis foliis supremis similibus, mediis et superioribus triangulari-ovatis attenuatis calycem subaequantibus laciniato-dentatis, dentibus inferioribus patulis aristato-acuminatis quam superiores longioribus; calyce florifero ovato-oblongo fructifero suborbiculato 1.3–1.9 cm. longo glabrescente, marginibus ciliatis; corolla flava 1–1.2 cm. longa, tuba recta exserta; labia superiore 3–4 mm. longa, margine inferiore convexo dentibus flavis oblique quadrilateralibus subtruncatis 0.5 mm. longis, 1.5 mm. latis;

abia inferiore 1 mm. longa flava vel raro violacea; seminibus reniformibus 5–6 mm. longis 3.5 mm. latis olivaceis, alis dorsalibus membranaceis, ventralibus obscuris.

Plant 0.6–4 dm. high, green, glabrous at base, pilose along the sides of the internodes above, simple: cauline leaves shorter than the internodes, oblong, or in very small specimens linear, scabrid, obtuse, crenate-dentate; the teeth broad and appressed: spikes 2–12-flowered: bracts scabrous, the lower similar to the upper leaves, the middle and upper triangular-ovate, attenuate, about equalling the calyx, laciniate-dentate; the lower teeth spreading, aristate-acuminate, longer than the upper: flowering calyx ovate-oblong; fruiting suborbicular, 1.3–1.9 cm. long, glabrescent, the margins ciliate: corolla yellow, 1–1.2 cm. long, the straight tube exserted; the upper lip 3–4 mm. long, its lower margin convex, the teeth yellow, obliquely quadrilateral, subtruncate, 0.5 mm. long, 1.5 mm. broad; the lower lip 1 mm. long, yellow or rarely violaceous: seeds reniform, 5–6 mm. long 3.5 mm. wide, olive-brown, the dorsal wing membranaceous, the ventral obscure.—QUEBEC, common on alpine meadows and slopes, altitude 950–1125 m., Table-topped Mountain, Gaspé Co., August 7, 1906 (*Fernald & Collins*, no. 248), August 12, 1881 (*J. A. Allen*): NEW HAMPSHIRE, "in alpinis Montium Alborum" (*Wm. Oakes*); "White Mount. in locis humidis alpinis cum *Veronica alpina* et caet," 1843 (*E. Tuckerman*); head of Oakes Gulf, August 28, 1877, August 29, 1890 (*E. & C. E. Faxon*); moist grassy soil, edge of Oaks Gulf, August 8, 1896 (*E. F. Williams*); Lion's Head, Alpine Garden, Mt. Washington, September 1, 1890 (*E. & C. E. Faxon*). Various specimens from the Labrador coast are apparently referable here.

From the essentially coastal *Rhinanthus Crista-galli* of New England and the Maritime Provinces *R. oblongifolius* is distinguished by several characters. In the coastal plant the leaves are narrower, lance- or linear-attenuate, and sharply serrate with more spreading teeth; and in drying the stems and foliage become strongly blackened. *R. oblongifolius*, with oblong crenate-toothed leaves, on the other hand, retains its green color even in the old specimens of Oakes. In *R. Crista-galli* the lateral teeth of the upper lip of the corolla are about as long as broad and dark-colored; in *R. oblongifolius* much broader than long and yellow. In *R. Crista-galli* the ventral wing of the seed is conspicuously thickened and clearly defined; in the seed of *R. oblongifolius* it is only slightly thickened and less clearly defined.

GRAY HERBARIUM.

IS RHINANTHUS CRISTA-GALLI AN INTRODUCED PLANT? — As long as all our New England *Rhinanthus* was supposed to be *R. Crista-galli* L. there was no question as to its being indigenous; its center of distribution was thought to be among the alpine or sub-alpine plants of the White Mountains, and its occurrence elsewhere seemed to indicate a distribution by no means unprecedented, since some plants found at a considerable elevation in Vermont and New Hampshire occur along the coast of Maine, a range recalling the distribution of the hermit thrush and some other distinctive White Mountain birds, which breed at sea level as far to the southwest as Casco Bay. But now that the White Mountain *Rhinanthus* is found to be a distinct and new species, the character of the stations in which the true *R. Crista-galli* occurs is worthy of notice. It seems to be always in fields and pastures and along roadsides; never away from human influence.

The writer first saw the plant at Cushing, Maine; the attention of a farmer being called to it, as a novelty to the writer, he replied: "Yes, it is getting to be very common now-a-days." At Cape Rosier, and at Eagle Island in Penobscot Bay, it was very common, but at both places the older farmers said that it was not there in their younger days; at Cape Rosier they called it "Mormon Weed," as it made its appearance at the time of the Mormon excitement, that is, some time after 1850. It was reported to have been introduced into Eagle Island in hay from the mainland. While the question of its being a native or a naturalized forcigner can hardly be settled positively, it would seem that the probabilities are in favor of the latter theory.— F. S. COLLINS, Malden, Massachusetts.

ACANTHOSPERMUM AUSTRALE AT LAWRENCE, MASSACHUSETTS.— A plant which grew last summer in a cabbage-garden in the suburbs of Lawrence attracted attention as something unusual and an unsuccessful effort was made to classify it. A specimen was sent to the Gray Herbarium and there determined as *Acanthospermum australe* (Loefl.) Ktze., a peculiar member of the *Compositae*, which is ordinarily confined to tropical regions. The cabbage field where the Acanthospermum grew had been fertilized by wool-waste from one of the mills, and as several strange plants were seen there the locality will be watched with interest another season. — E. S. SCHNEIDER, Lawrence, Massachusetts.

FURTHER INFORMATION REGARDING THE OCCURRENCE OF DRYOPTERIS FILIX-MAS IN VERMONT.

Mabel A. Strong.

On the twelfth of last August, while spending a day in the woods in central Vermont I had the pleasure of finding *Dryopteris Filix-mas*. At first I saw only five or six clumps, containing from one to six plants each and growing in a partially exposed place, seemingly an old wood road or spring water course and overgrown with thin grass, dwarfed raspberry bushes and weeds; but upon a second visit and more careful exploration I counted over forty clumps comprising a hundred or more plants and extending farther into the deeper woods. The whole group, so far as observed, covered an area which one might have walked around in perhaps three minutes. The individual ferns varied from tiny ones to magnificent specimens waist high.

Noticeable at the edge of the deeper wood and shading some of the ferns in question are several large butternut trees. The soil is very black and rich while the underlying and partially exposed ledges are of a lead-colored rock. At the left side of this road or water course is a thick growth of sapling maples, but none of the ferns were found there.

This wood crowns the top of a pasture hill at an elevation of about sixteen hundred feet and has a northern exposure. It is situated in the southwestern corner of the town of Woodstock near the Bridgewater and Reading lines. In other words it is about six miles due west of Hartland Four Corners, where Miss Darling discovered this fern over a year ago.

Growing in the midst of the area just described is one fine clump of *Dryopteris Goldiana* and distributed through the woods are quantities of the finest specimens of Braun's Holly Fern I have ever seen, excepting those growing near the summit of Killington.

Several other species of *Dryopteris* are found in the immediate vicinity, namely *D. spinulosa*, *D. marginalis*, *D. noveboracensis*, and *D. acrostichoides*, while somewhat lower on the slope and in the open pasture occur *Dicksonia*, *Adiantum*, and *Asplenium Filix-foemina*.

A few rods farther down the road leading past this place and toward Long Hill in Bridgewater, Miss Elizabeth Billings found the Blue Fringed Gentian growing.

WOODSTOCK, VERMONT.

ARCEUTHOBIUM IN THE RANGELEY REGION.—While walking along the line of the South Bog Railroad, in the township of Rangeley Plantation, Maine, I passed through a considerable quantity of Black Spruce. A few of the trees had suspicious-looking "witches' brooms" on them, which proved on investigation to contain *Arceuthobium pusillum* Peck. Very few of the trees, however, were thus affected. The nearest recorded station for this species so far as I know is in Pleasant Ridge Township, about forty miles to the east of the one reported here.— JOHN MURDOCH, JR., Harvard Forestry Expedition.

NOTE ON CIRSIUM MUTICUM, VAR. MONTICOLA.—In the Ottawa Naturalist, I recently described the alpine thistle of the Shickshock Mountains, and inadvertently placed it in *Cnicus*, a genus which, as now everywhere interpreted, consists of the single species, *Cnicus benedictus*, the Blessed Thistle. The plant of the Shickshock Mountains should bear the name

CIRSIUM MUTICUM Michx., var. **monticola**, n. comb.—*Cnicus muticus*, var. *monticola* Fernald, Ottawa Nat. xix. 166 (1905).—Explorations during the past summer showed that on Mt. Albert this plant abounds throughout the serpentine area, descending from the alpine meadows, in the gorge of Ruisseau à la Neige, nearly to Lac au Diable at an altitude of 550 meters; while it is apparently quite absent from the hornblende district of the mountain. It was also found on Table-topped Mountain, in a single alpine meadow whose mixed soil supported *Danthonia intermedia*, *Solidago multiradiata*, and a few other plants, which in the Shickshock Mountains have their great development on the serpentine.—M. L. FERNALD, Gray Herbarium.

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ON THE RULES OF BOTANICAL NOMENCLATURE ADOPTED BY THE VIENNA CONGRESS.

Introductory.

No subject connected with systematic botany has in recent years been more earnestly discussed than the nomenclature question. Indeed, the prolonged and detailed controversies regarding this matter must have been wearisome to many persons who, although interested in plants, have had no leisure or desire to go into bibliographical technicalities. To such persons, however, as well as to the professional taxonomist, it should be a source of gratification that a considerable step has been taken toward international agreement on the points at issue.

Before the rules and recommendations adopted by the Vienna Botanical Congress are here presented, it may be well to advert very briefly to the peculiar difficulties which have been involved in the nomenclature question and to recall the circumstances of the international meeting at Vienna.

For many decades it has been almost universally felt that botanical nomenclature should rest in a general way on the principle of priority of publication, or in other words, that the name of a plant was the first one assigned to it. Nearly all botanists of note have readily assented to this general idea, but great difficulties have arisen regarding the precise limitations which should be imposed upon the principle. Thus, botanists of past generations, including such great leaders as the De Candolles, Bentham, the Hookers, Gray, von Martius, Eichler, Baillon, and others, have followed the principle of priority, yet they have made frequent exceptions based on considerations of taste and convenience as well as practicality.

With the expansion of the subject the difficulty of agreement on these exceptions has increased and some recent writers have been disposed at times to criticise rather harshly the earlier botanists for making any exceptions whatever. It should be noticed, however, that even the more strenuous of these reformers themselves admit certain exceptions. They have found it necessary, for instance, to fix initial dates, and to rule out certain names as too vague in their definition or too uncouth in their form to be accepted.

Ideas as to the best mode of establishing rules or reaching a general agreement regarding the necessary exceptions to the bald principle of priority have differed widely and given rise to lively controversy. To some it has seemed best to devise an ideal system and then, without much reference to the wishes or convenience of their colleagues, to apply it in local publication. The idea of such writers has been, if we understand it rightly, that a system of rules if devised with sufficient care would ultimately gain adherence and be recognized as worthy of general adoption.

To the vast majority, however, it has been clear that the subject was a broad one involving much mutual sacrifice before the now divergent usages at different botanical centres could be brought into harmony. It was also decidedly an international question. If our Latin botanical nomenclature has any real significance it is that botanists of remote regions and different nations may have a common technical language. It was therefore evident that rules devised in one country stood exceedingly little chance of adoption in others and that the whole question could be settled only by a patient effort at international understanding.

In this way uniformity can be attained gradually. In the first place it should be possible to reach agreement on some of the more obvious rules, upon such in fact as are sufficiently evident in the present state of botanical classification to make not only their need of settlement but the particular way in which they should be decided, clear to the majority of systematists of different nations. If such general principles can be decided and the majority of botanists convinced of their fairness, much will have been accomplished. Attention can then be turned to minor details on which opinions are still widely divergent, and, as each successive matter reaches such clearness as to make its solution possible by international agreement, it can then be taken up and decided by subsequent international gatherings.

The great advantage of such a method of gradually getting all nations into harmony will be evident to every thoughtful and broad-minded person interested in botany. In fact it appears to be, if not the speediest method imaginable, at least the most practicable — the way, in fact, which will bring us to the desired uniformity with the least friction, with the least feeling of injustice, and the minimum production of needless synonyms.

For the last fifteen years there has been a growing desire for an international meeting of representative botanists who should give the matter of nomenclature careful consideration and come if possible to some agreement on the fundamental rules to be followed. This feeling took definite form in the year 1900 when preliminary sessions of such a gathering were held in connection with the Paris Congress of botanists. At this meeting a bureau was formed for the organization of an International Botanical Congress to be held at Vienna in June, 1905.

A commission of forty-seven botanists, representing all the more important countries of the world was also formed, to whom advisory power in the arrangements for the Vienna Congress was intrusted. This commission was well selected to include persons not merely of high standing in systematic botany but representing the most diverse views on nomenclature. The commission worked in harmony and special credit is due to Prof. John Briquet of Geneva, the reporter-general, who devoted for some years much of his time to the arrangements for the congress.

It was early decided that the proper basis for any new group of rules would be the time-honored Paris Code of 1867, often called the De Candollean Code. Botanists of the world were invited to submit their propositions for the amendment and improvement of this code and ample time given them for the purpose. Many responded with carefully elaborated propositions and suggestions. Months before the congress was called together the reporter-general published a detailed statement, not only of all the new suggestions, which had been received, but of all the important propositions published on the subject of botanical nomenclature since 1867, the date of the old code. These matters were lucidly presented in a large quarto publication printed in parallel columns and giving an admirable means of comparing the different systems proposed.

Representation at the Vienna Congress was freely offered to all

the leading botanical establishments of the world, to botanical and natural history societies and academies, and finally to all those botanists who had offered amendments to the older code. Circular after circular was issued and it would be difficult to conceive of any expedient which was not employed to make the congress representative and render its proceedings intelligent and thoroughly impartial.

To the great credit of our science, it may be said without reservation, that the leading botanical establishments of the world took the congress seriously. There met at Vienna between five and six hundred botanists. A week was spent in the various sessions of the congress. During this time the systematists met daily in prolonged and very earnest sessions for discussion and legislation on the nomenclature matter. They were permitted to speak in French, English, or German, and the substance of their remarks was promptly translated into each of the other two of these languages. The meeting was exceptionally fortunate in its chairman, Prof. Charles Flahault of Montpellier, whose quick understanding of complicated situations, skilful generalship of the polyglot debates, and obvious impartiality commanded universal respect and gained general commendation. Every opportunity for free discussion was given so far as time permitted.

Several readers of RHODORA have expressed the wish that the rules adopted by the Vienna Congress should be printed in our journal and the English version is herewith given. The list of generic names, which, notwithstanding technical lack of priority, it was decided to retain, includes about four hundred names. Lack of space does not permit the reprinting of this list in full but the names are here given which apply to our New England flora.

It will be a matter of great interest to the readers of RHODORA to learn that many of the leading botanical establishments of the world have already signified either officially or unofficially their intention to accept the Vienna rulings, indeed this acceptance has been so general as to render divergent practice hereafter merely local and provincial.

A question, which has been very frequently asked, is how much change these rules will entail in current usage. It is very difficult to give any precise answer, but, in a general way, it may be said, so far as the Grayan nomenclature common in New England is concerned, the adoption of the Vienna rules is likely to necessitate change

of 3 to 5 per cent. of generic names and between 10 and 20 per cent. of specific names. Persons judging of this matter are specially urged to make careful distinction between changes caused by the new rules on the one hand and the host of alterations on the other which are rendered necessary by new light upon plant affinities, the limitation of species, division of confused genera, etc.— alterations which are botanical rather than nomenclatorial in their nature.

International rules for Botanical Nomenclature chiefly of Vascular Plants.

Chapter I. General considerations and leading principles.

Art. 1. Natural history can make no progress without a regular system of nomenclature, which is recognized and used by the great majority of naturalists in all countries.

Art. 2. The prescriptions which govern the exact system of botanical nomenclature are divided into *principles, rules* and *recommendations*. The principles (art. 1–9, 10–14 and 15–18) are the foundation of the rules and recommendations. The rules (art. 10–58), destined to put in order the nomenclature which the past has bequeathed to us, and to form the basis for the future, are always retroactive: names or forms of nomenclature which are contrary to a rule cannot be maintained. Recommendations bear on secondary points, their object being to ensure for the future a greater uniformity and clearness in nomenclature: names or forms of nomenclature contrary to a recommendation are not a model to copy, but cannot be rejected.

Art. 3. The rules of nomenclature should neither be arbitrary nor imposed by authority. They must be simple and founded on considerations clear and forcible enough for everyone to comprehend and be disposed to accept.

Art. 4. The essential points in nomenclature are: 1. to aim at fixity of names; 2. to avoid or to reject the use of forms and names which may cause error or ambiguity or throw science into confusion.

Next in importance is the avoidance of all useless creation of names.

Other considerations, such as absolute grammatical correctness, regularity or euphony of names, more or less prevailing custom,

respect for persons, etc., notwithstanding their undeniable importance are relatively accessory.

Art. 5. No custom contrary to rule can be upheld if it leads to confusion or error. When a custom offers no serious inconvenience of this kind, it may be a ground for exceptions which we must however abstain from extending or copying. Finally in the absence of rule, or where the consequences of rules are doubtful, established custom becomes law.

Art. 6. The principles and forms of nomenclature should be as similar as possible in botany and in zoology; but botanical nomenclature is entirely independent of zoological nomenclature.

Art. 7. Scientific names are in latin for all groups. When taken from another language, a latin termination is given them, except in cases sanctioned by custom. If translated into a modern language, it is desirable that they should preserve as great a resemblance as possible to the original latin names.

Art. 8. Nomenclature comprises two categories of names: 1. Names, or rather terms, which express the nature of the groups comprehended one within the other. 2. Names peculiar to each of the groups of plants that observation has made known.

Art. 9. The rules and recommendations of botanical nomenclature apply to all classes of the plant kingdom, reserving special arrangements for fossil plants and non-vascular plants.[1]

Chapter II. On the manner of designating the nature and the subordination of the groups which constitute the plant kingdom.

Art. 10. Every individual plant belongs to a species (*species*), every species to a genus (*genus*), every genus to a family (*familia*) every family to an order (*ordo*), every order to a class (*classis*), every class to a division (*divisio*).

Art. 11. In many species we distinguish varieties (*varietas*) and forms (*forma*); and in some cultivated species, modifications still more numerous; in many genera sections (*sectio*), in many families tribes (*tribus*).

Art. 12. Finally if circumstances require us to distinguish a greater number of intermediate groups, it is easy, by putting the

[1] These special arrangements have been reserved for the Congress of 1910. They comprise: 1. rules bearing on special points in relation to the nature of fossils or the lower plants; 2. lists of *nomina conservanda* for all divisions of plants other than Phanerogams.

syllable *sub* before the name of a group, to form subdivisions of that group. In this way subfamily (*subfamilia*) designates a group between a family and a tribe, subtribe (*subtribus*) a group between a tribe and a genus, etc. The arrangement of subordinate groups may thus be carried, for wild plants only, to twenty-one degrees, in the following order: Regnum vegetabile. Divisio. Subdivisio. Classis. Subclassis. Ordo. Subordo. Familia. Subfamilia. Tribus. Subtribus. Genus. Subgenus. Sectio. Subsectio. Species. Subspecies. Varietas. Subvarietas. Forma. Individuum.

If this list of groups is insufficient it can be augmented by the intercalation of supplementary groups, so long as these do not introduce confusion or error.

Example: *Series* and *Subseries* are groups which can be intercalated between subsection and species.

Art. 13. The definition of each of these names of groups varies, up to a certain point, according to individual opinion and the state of the science, but their relative order, sanctioned by custom must not be altered. No classification is admissible which contains such alterations.

Examples of inadmissible alterations are,— a form divided into varieties, a species containing genera, a genus containing families or tribes.

Art. 14. The fertilization of one species by another, gives rise to a hybrid (*hybrida*); that of a modification or subdivision of a species by another modification of the same species gives rise to a half-breed (*mistus*, *mule* of florists).

Recommendations.

I. The arrangement of species in a genus or in a subdivision of a genus is made by means of typographic signs, letters or numerals. Hybrids are arranged after one of the parent species, with the sign × placed before the generic name.

The arrangement of subspecies under a species is made by letters or numerals; that of varieties by the series of greek letters α, β, γ, etc. Groups below varieties and also half-breeds are indicated by letters, numerals or typographic signs at the author's will.

Modifications of cultivated plants should be associated, as far as possible, with the species from which they are derived.

Chapter III. On the manner of designating each group or association of plants.

Section 1. General principles; priority.

Art. 15. Each natural group of plants [1] can bear in science only

[1] See observation to article 9.

one valid designation, namely the oldest, provided that it is in conformity with the rules of Nomenclature and the conditions laid down in articles 19 and 20 of section 2.

Art. 16. The designation of a group by one or several names is not for the purpose of describing the characters or the history of the group, but that we may be understood when we wish to speak of it.

Art. 17. No one should change a name or a combination of names without serious motives, based on a more profound knowledge of facts, or on the necessity of giving up a nomenclature that is contrary to rules.

Art. 18. The form, number and arrangement of names depend on the nature of each group, according to the following rules.

Section 2. **Point of departure for nomenclature; limitation of principle of priority.**

Art. 19. Botanical nomenclature begins with the *Species Plantarum* of Linnaeus, ed. 1. (1753) for all groups of vascular plants. It is agreed to associate genera, the names of which appear in this work, with the descriptions given of them in the *Genera Plantarum* ed. 5. (1754).

Art. 20. However, to avoid disadvantageous changes in the nomenclature of genera by the strict application of the rules of Nomenclature, and especially of the principle of priority in starting from 1753, the rules provide a list of names which must be retained in all cases. These names are by preference those which have come into general use in the fifty years following their publication, or which have been used in monographs and important floristic (floristiques) works up to the year 1890. The list of these names forms an appendix to the rules of Nomenclature.

Section 3. **Nomenclature of the different kinds of groups.**

§ 1. *Names of groups above the family.*

Recommendations. The following suggestions as to the nomenclature of groups of higher rank than the family will tend to clearness and uniformity.

II. Names of divisions and subdivisions, of classes and subclasses are taken from one of their characters. They are expressed by words of greek or latin origin, some similarity of form and termination being given to those that designate groups of the same nature.

Examples: *Angiospermae, Gymnospermae*; *Monocotyledoneae, Dicotyledoneae*; *Pteridophyta*; *Coniferae*. Among Cryptogams old family names such as *Fungi, Lichenes, Algae*, may be used for names of groups above the rank of family.

III. Orders are designated preferably by the name of one of their principal families, with the ending *-ales*. Suborders are designated in a similar manner, with the ending *-ineae*. But other terminations may be retained for these names, provided that they do not lead to confusion or error.

Examples of names of orders: *Polygonales* (from *Polygonaceae*), *Urticales* (from *Urticaceae*), *Glumiflorae*, *Centrospermae*, *Parietales*, *Tubiflorae*, *Microspermae*, *Contortae*. Examples of names of suborders: *Bromeliineae* (from *Bromeliaceae*), *Malvineae* (from *Malvaceae*), *Tricoccae*, *Enantioblastae*.

§ 2. *Names of families and subfamilies, tribes and subtribes.*

Art. 21. Families (*familiae*) are designated by the name of one of their genera or ancient generic names with the ending *-aceae*.

Examples: *Rosaceae* (from *Rosa*), *Salicaceae* (from *Salix*), *Caryophyllaceae* (from *Dianthus Caryophyllus*), etc.

Art. 22. The following names, owing to long usage, are an exception to the rule: *Palmae, Gramineae, Cruciferae, Leguminosae, Guttiferae, Umbelliferae, Labiatae, Compositae.*

Art. 23. Names of subfamilies (*subfamiliae*) are taken from the name of one of the genera in the group, with the ending *-oideae*. The same holds for the tribes (*tribus*) with the ending *-eae*, and for the subtribes (*subtribus*) with the ending *-inae*.

Examples of subfamilies: *Asphodeloideae* (from *Asphodelus*), *Rumicoideae* (from *Rumex*); tribes: *Asclepiadeae* (from *Asclepias*), *Phyllantheae* (from *Phyllanthus*); subtribes: *Metastelmatinae* (from *Metastelma*), *Madiinae* (from *Madia*).

§ 3. *Names of genera and divisions of genera.*

Art. 24. Genera receive names, substantives (or adjectives used as substantives) in the singular number and written with a capital letter, which may be compared with our own family names. These names may be taken from any source whatever and may even be composed in an absolutely arbitrary manner.

Examples: *Rosa, Convolvulus, Hedysarum, Bartramia, Liquidambar, Gloriosa, Impatiens, Manihot.*

Art. 25. Subgenera and sections also receive names, usually substantives and resembling the names of genera. Names of subsections and other lower subdivisions of genera are preferably adjectives in the plural number and written with a capital letter, or their place may be taken by an ordinal number or a letter.

Examples. — Substantives: *Fraxinaster, Trifoliastrum, Adenoscilla, Euhermannia, Archieracium, Micromelilotus, Pseudinga, Heterodraba, Gymnocimum, Neoplantago, Stachyotypus.* Adjectives: *Pleiostylae, Fimbriati, Bibracteolata, Pachycladae.*

Recommendations.

IV. When the name of a genus, subgenus or section is taken from the name of a person, it is formed in the following manner:

a) When the name ends in a vowel, the letter *a* is added (for example *Glazioua* after Glaziou; *Bureaua* after Bureau), except when the name already ends in *a*, in which case *ea* is added (e. g. *Collaea* after Colla).

b) When the name ends in a consonant, the letters *ia* are added (thus *Magnusia* after Magnus; *Ramondia* after Ramond), except when the name ends in *er*, in which case *a* is added (e. g. *Kernera* after Kerner).

c) The spelling of the syllables unaffected by these finals is retained, even with the consonants *k* and *w* or with groupings of vowels which were not used in classic latin. Letters which are unknown to botanical latin must be transcribed, diacritic signs are suppressed. The german ä, ö, ü become ae, oe, ue, the French é, è and ê become generally e.

d) Names may be accompanied by a prefix, or a suffix, or modified by anagram or abbreviation. In these cases they count as different words from the original name. E. g. *Durvillea* and *Urvillea*, *Lapeyrousea* and *Peyrousea*, *Englera*, *Englerastrum* and *Englerella*, *Bouchea* and *Ubochea*, *Gerardia* and *Graderia*, *Martia* and *Martiusia*.

V. Botanists who are publishing generic names show judgment and taste by attending to the following recommendations:

a) Not to make names very long or difficult to pronounce.

b) Not to use again a name which has already been used and has lapsed into synonymy (homonym).

c) Not to dedicate genera to persons who are in all respects strangers to botany, or at least to natural science, nor to persons quite unknown.

d) Not to take names from barbarous tongues, unless those names are frequently quoted in books of travel, and have an agreeable form that is readily adapted to the latin tongue and to the tongues of civilized countries.

e) To recall, if possible, by the formation or ending of the name, the affinities or the analogies of the genus.

f) To avoid adjectives used as nouns.

g) Not to give a genus a name whose form is rather that of a subgenus or section (e. g. *Eusideroxylon*, a name given to a genus of Lauraceae, which, however, being valid, cannot be changed).

h) Not to make names by the combination of two languages (*nomina hybrida*).

VI. Botanists constructing names for subgenera or sections, will do well to attend to the preceding recommendations and also to the following:

a) Give, where possible, to the principal division of a genus, a name which, by some modification or addition, calls the genus to mind (for instance, *Eu* placed at the beginning of the name, when it is of greek origin; *-astrum*, *-ella* at the end of the name, when latin, or any other modification consistent with the grammar and usages of the latin language).

b) Avoid calling a subgenus or a section by the name of the genus to which it belongs, with the final *-oides* or *-opsis*; on the contrary reserve this ending for a section which resembles another genus, by adding in that case *-oides* or *-opsis* to the name of that other genus, if it is of greek origin, to form the name of the section.

c) Avoid taking as the name of a subgenus or section a name which is already in use as such in another genus, or which is the name of an admitted genus.

VII. When it is required to express a subgeneric or sectional name together with the name of the genus and the name of the species, the name of the section is put between the others in a parenthesis. E. g. *Astragalus* (*Cycloglottis*) *contortuplicatus*.

§ 4. *Names of species and of subdivisions of species.*

Art. 26. All species, even those that singly constitute a genus, are designated by the name of the genus to which they belong followed by a name (or epithet) termed specific, usually of the nature of an adjective (forming a combination of two names, a binomial, or binary name).

Examples: *Dianthus monspessulanus, Papaver Rhoeas, Fumaria Gussonei, Uromyces Fabae, Geranium Robertianum, Embelia Sarasinorum, Adiantum Capillus-Veneris.* Linnaeus has sometimes introduced symbols in specific names; these must according to art. 26 be transcribed. Ex.: *Scandix Pecten-Veneris* (= *Scandix Pecten* ♀); *Veronica Anagallis-aquatica* (= *Veronica Anagallis* ▽).

Recommendations.

VIII. The specific name should, in general, give some indication of the appearance, the characters, the origin, the history or the properties of the species. If taken from the name of a person, it usually recalls the name of the one who discovered or described it, or was in some way concerned with it.

IX. Names of men and women and also names of countries and localities used as specific names, may be substantives in the genitive (*Clusii, saharae*) or adjectives (*Clusianus, dahuricus*). It will be well, in the future, to avoid the use of the genitive and the adjectival form of the same name to designate two different species of the same genus [for example *Lysimachia Hemsleyana* Maxim. (1891) and *L. Hemsleyi* Franch. (1895)].

X. Specific names begin with a small letter except those which are taken from names of persons (substantives or adjectives) or those which are taken from generic names (substantives or adjectives).

Examples: *Ficus indica, Circaea lutetiana, Brassica Napus, Lythrum Hyssopifolia, Aster novibelgii, Malva Tournefortiana, Phyteuma Halleri.*

XI. When a specific name is taken from the name of a man, it is formed in the following way:

a) When the name ends in a vowel, the letter *i* is added (thus *Glazioui* from Glaziou: *Bureaui* from Bureau), except when the name ends in *a*, when *e* is added (thus *Balansae* from Balansa).

b) When the name ends in a consonant, the letters *ii* are added (thus *Magnusii* from Magnus; *Ramondii* from Ramond), except when the word ends in *er* when *i* is added (ex. *Kerneri*, from Kerner).

c) Syllables which are not modified by these endings retain their original spelling, even in the case of the consonants k and w or groupings of vowels which are not used in classic latin. Letters foreign to the latin of botanists should be transcribed, and diacritic signs suppressed. The german ä, ö, ü, become ae, oe, ue, the french é, è, and ê become, in general, e.

d) When specific names taken from the name of a person have an adjectival form a similar plan is adopted (*Geranium Robertianum, Carex Hallerana, Ranunculus Boreauanus*, etc.)

XII. The same applies to the names of women. These are written in the feminine when they have a substantial form.

Example: *Cypripedium Hookerae, Rosa Beatricis, Scabiosa Olgae, Omphalodes Luciliae.*

XIII. In the formation of specific names composed of two or several roots and taken from latin or greek, the vowel placed between the two roots

becomes a connecting vowel, in latin *i*, in greek *o*; thus we write *menthifolia, salviifolia*, not *menthaefolia, salviaefolia*. When the second root begins with a vowel and euphony demands, the connecting vowel is eliminated (e. g. *calliantha, lepidantha*). The connecting *ae* is legitimate only when etymology demands (e. g. *caricaeformis* from *Carica*, may be retained along with *cariciformis* from *Carex*).

XIV. In forming specific names, botanists will do well to note the following recommendations:

a) Avoid very long names and those which are difficult to pronounce.

b) Avoid names which express a character common to all or nearly all the species of a genus.

c) Avoid names taken from little known or very restricted localities, unless the species be very local.

d) Avoid, in the same genus, names which are very much alike, especially those which differ only in their last letters.

e) Adopt unpublished names found in travellers' notes and herbaria, attributing them to the authors concerned, only when those concerned have approved the publication.

f) Avoid names which have been used before in the genus, or in any closely allied genus, and which have lapsed into synonymy (homonyms).

g) Do not name a species after a person who has neither discovered, nor described, nor figured, nor in any way studied it.

h) Avoid specific names formed of two words.

i) Avoid names which have the same meaning as the generic name.

Art. 27. Two species of the same genus cannot bear the same specific name, but the same specific name may be given in several genera.

Example: *Arabis spathulata* DC. and *Lepidium spathulatum* Phil. are valid as two names of Crucifers; but *Arabis spathulata* Nutt. in Torr. and Gray cannot be maintained, on account of the existence of *Arabis spathulata* DC., a name previously given to another valid species of *Arabis*.

Art. 28. Names of subspecies and varieties are formed like specific names and follow them in order, beginning with those of the highest rank. The same holds for subvarieties, forms, and slight or transient modifications of wild plants which receive a name or numbers or letters to facilitate their arrangement. Use of a binary nomenclature for subdivisions of species is not admissible.

Examples: *Andropogon ternatus* subsp. *macrothrix* (not *Andropogon macrothrix* or *Andropogon ternatus* subsp. *A. macrothrix*); *Herniaria hirsuta* var. *diandra* (not *Herniaria diandra* or *Herniaria hirsuta* var. *H. diandra*); forma *nanus*, forma *maculatum*.

Recommendation.

XV. Recommendations made for specific names apply equally to names of subdivisions of species. These agree with the generic name when they have an adjectival form (*Thymus Serpyllum* var. *angustifolius*, *Ranunculus acris* subsp. *Friesianus*).

Art. 29. Two subspecies of the same species cannot have the same name. A given name can only be used once for a variety of a given

species, even when dealing with varieties which are classed under different subspecies. The same holds for subvarieties and forms.

On the other hand the same name may be employed for subdivisions of different species, and the subdivisions of any one species may bear the same name as other species.

Examples. — The following are admissible: *Rosa Jundzillii* var. *leioclada* and *Rosa glutinosa* var. *leioclada*; *Viola tricolor* var. *hirta*, in spite of the existence already of a different species named *Viola hirta*. The following are incorrect: *Erysimum hieraciifolium* subsp. *strictum* var. *longisiliquum* and *E. hieraciifolium* subsp. *pannonicum* var. *longisiliquum* — a form of nomenclature which allows two varieties bearing the same name in the same species.

Recommendation.

XVI. Botanists are recommended to use as little as possible the privilege granted in the second part of article 29, in order to avoid confusion and mistakes and also to reduce to a minimum the necessary changes of name when the subdivisons of species are raised to specific rank or vice versa.

Art. 30. Forms and half-breeds among cultivated plants should receive fancy names, in common language, as different as possible from the latin names of the species or varieties. When they can be traced back to a species, a subspecies or a botanical variety this is indicated by a succession of names.

Example: *Pelargonium zonale* Mrs. Pollock.

§ 5. *Names of hybrids and half-breeds (mules).*

Art. 31. Hybrids between species of the same genus, or presumably so, are designated by a formula and, whenever it seems useful or necessary, by a name.

The formula consists of the names or specific epithets of the two parents in alphabetical order and connected by the sign ×. When the hybrid is of known experimental origin the formula may be made more precise by the addition of the signs, ♀ ♂.

The name, which is subject to the same rules as names of species, is distinguished from the latter by absence of an ordinal number and by the sign × before the name.

Examples: × *Salix capreola* = *Salix aurita* × *caprea*; *Digitalis lutea* ♀ × *purpurea* ♂; *Digitalis lutea* ♂ × *purpurea* ♀.

Art. 32. Intergeneric hybrids (between species of different genera) or presumably such, are also designated by a formula, and, when it seems useful or necessary, by a name.

The formula consists of the names of the two parents, in alphabetical order.

The hybrid is associated with the one of the two genera which precedes the other in alphabetical order. The name is preceded by the sign ×.

Examples: × *Ammophila baltica* = *Ammophila arenaria* × *Calamagrostis epigeios*.

Art. 33. Ternary hybrids, or those of a higher order, are designated like ordinary hybrids by a formula and a name.

Examples: × *Salix Straehleri* = *S. aurita* × *cinerea* × *repens* or *S.* (*aurita* × *repens*) × *cinerea*.

Art. 34. When there is reason to distinguish the different forms of a hybrid (pleomorphic hybrids, combinations between different forms of collective species etc.) the subdivisions are classed under the hybrid like the subdivisions of species under a species.

Examples: × *Mentha villosa* β *Lamarckii* (= *M. longifolia* × *rotundifolia*). The preponderance of the characters of one or other parent may be indicated in the formulas in the following manner: *Mentha longifolia* > × *rotundifolia*, *M. longifolia* × < *rotundifolia*, *Cirsium supercanum* × *rivulare*, etc. etc. The participation of a particular variety may also be indicated. Example: *Salix caprea* × *daphnoides* var. *pulchra*.

Recommendation.

XVII. Half-breeds, or presumably such, may be designated by a name and a formula. Names of half-breeds are intercalated among the subdivisions of a species preceded by the sign ×. In the formula the names of the parents are in alphabetical order.

Section 4. **The publication of names and the date of each name or combination of names.**

Art. 35. Publication is effected by the sale or public distribution of printed matter or indelible autographs.

Communication of new names at a public meeting, or the placing of names in collections or gardens open to the public, do not constitute publication.

Examples. — Effective publication without printed matter: *Salvia oxyodon* Webb and Heldr. was published in July 1850 in an autograph catalogue and put on sale (Webb and Heldreich, *Catalogus plantarum hispanicarum, etc. ab A. Blanco lectarum*, Parisiis, Jul. 1850 in folio).— Non-effective publication at a public meeting: Cusson announced his establishment of the genus *Physospermum* in a memoir read at the Société des Sciences de Montpellier in 1773, and later in 1782 or 1783 at the Société de Médecine de Paris, but its effective publication dates from 1787, in the *Mémoires de la Soc. Roy. de Médecine de Paris*, vol. V, 1re partie.

Art. 36. On and after January 1, 1908, the publication of names of new groups will be valid only when they are accompanied by a latin diagnosis.

Art. 37. A species or a subdivision of a species, announced in a work, with a complete specific or varietal name, but without diagnosis or reference to a former description under another name, is not valid. Citation in synonymy or incidental mention of a name is not effective publication, and the same applies to the mention of name on a ticket issued with a dried plant without printed or autographed diagnosis;

Plates accompanied with analyses are equivalent to a description. but this applies only to plates published before January 1, 1908.

Examples.— The following are valid publications: *Onobrychis eubrychidea* Boiss. *Fl. or.* II, 546 (1872) published with description; *Panax nossibiensis* Drake in Grandidier *Hist. Phys. Nat. et Polit. de Madagascar*, Vol. XXXV, t. V, III, 5e part., Pl. 406 (1896), published in the form of a plate with analyses; *Cynanchum nivale* Nym. *Syll. fl. Eur.* 108 (1854–1855) published with a reference to *Vincetoxicum nivale* Boiss. et Heldr. previously described. *Hieracium Flahaultianum* Arv.-Touv. et Gaut., published in an exsiccata accompanied by a printed diagnosis (*Hieraciotheca gallica*, nos. 935–942, 1903).— The following are not valid: *Sciadophyllum heterotrichum* Decaisne et Planch. in *Rev. Hortic.*, ser. IV, III, 107 (1854), published without description or reference to a previous description under another name; *Ornithogalum undulatum* Hort. Berol. ex Kunth *Enum. pl.* IV, 348 (1843), quoted as a synonym of *Myogalum Boucheanum* Kunth l. c., the name adopted by the author, is not a valid publication; when transferred to *Ornithogalum*, this species must be called *Ornithogalum Boucheanum* Aschers. in *Osterr. Bot. Zeitschr.* XVI, 192 (1866); *Erythrina micropteryx* Poepp. quoted as a synonym of *Micropteryx Poeppigiana* Walp. in *Linnaea* XXIII, 740 (1850) is not a valid publication; the species in question, when placed in the genus *Erythrina* must be called *Erythrina Poeppigiana* O. F. Cook in *U. S. Dep. Agr.* Bull. no. 25, p. 57 (1901); *Nepeta Sieheana* Hausskn. which appears without diagnosis in an exsiccata (W. Siehe, Bot. Reise nach Cicilien, no. 521, 1896), is not valid.

Art. 38. A genus or any other group of higher rank than a species, named or announced without being characterised conformably to article 37 cannot be regarded as effectively published (*nomen nudum*). The mere indication of species as belonging to a new genus or of genera as belonging to a higher group, does not allow us to accept the genus or group in question as characterised and effectively published. An exception is made in the case of the generic names mentioned by Linnaeus in the *Species Plantarum* ed. 1., 1753, names which we associate with the descriptions in the *Genera Plantarum* ed. 5., 1754 (See article 19).

Examples. — The following are valid publications: *Carphalea* Juss. *Gen. Pl.* 198 (1789), published with a description; *Thuspeinanta* Dur. *Ind. Gen. Phaner.*, p. X (1888), published with a reference to the genus *Tapeinanthus*

Boiss. previously described; *Stipa* L. *Sp. Pl.* ed. 1, 78 (1753), valid because accompanied by a description in the *Genera Plantarum* ed. 5, no. 84 (1754).— The following are not valid: *Egeria* Neraud (*Bot. Voy. Freycinet*, p. 28 (1826), published without diagnosis or reference to a description previously made under another name; *Acosmus* Desv. mentioned incidentally as a synonym of the genus *Aspicarpa* Rich. by De Candolle (*Prodr.* 1, 583 [1824]); *Zatarhendi* Forsk. *Fl. Aeg. Arab.*, p. CXV (1775), based only on the enumeration of 3 species of the genus *Ocimum* without indication of characters.

Art. 39. The date of a name or of a combination of names is that of their effective publication. In the absence of proof to the contrary, the date placed on the work containing the name or combination of names is regarded as correct. On and after January 1st, 1908, the date of publication of the latin diagnosis only can be taken into account in questions of priority.

Examples. — *Mentha foliicoma* Opiz was distributed by its author in 1832, but the name dates from 1882 (published by Déséglise *Menth. Op.* in *Bull. soc. étud. scient. Angers*, 1881–1882, p. 210); *Mentha bracteolata* Op. *Seznam*, p. 65 (1852) without description, takes effect only from 1882, when it was published with a description (Déséglise l. c., p. 211). There is some reason for supposing that the first volume of Adanson's *Familles des Plantes* was published in 1762, but in absence of certainty the date 1763 on the title-page is assumed to be correct. The different parts of Willdenow's *Species Plantarum* were published as follows: vol. I, 1798; vol. II, 2, 1800; vol. III, 1, 1801; vol. III, 2, 1803; vol. III, 3, 1804; vol. IV, 2, 1806; and not in the years 1797, 1799, 1800, 1800, 1800 and 1805 respectively, as would appear from the title-page of the volumes: it is the earlier series of dates which takes effect. — The third volume of the *Prodromus florae hispanicae* of Willkomm & Lange, the title-page of which bears the date 1880, was published in four parts, pp. 1–240 in 1874, pp. 241–512 in 1877, pp. 513–736 in 1878, p. 737 to the end in 1880, and it is these dates which take effect.

Recommendations. Botanists will do well, in publishing, to conform to the following recommendations:

XVIII. Not to publish a name without clearly indicating whether it is the name of a family or a tribe, a genus or a section, a species or a variety; briefly, without expressing an opinion on the nature of the group to which they give the name.

XIX. To avoid publishing or mentioning in their publications unpublished names which they do not accept, especially if the persons responsible for these names have not formally authorised their publication (see Rec. XIV, *e*).

XX. When publishing new names in works written in a modern language (floras, catalogues etc.) to publish simultaneously the latin diagnoses which will make the names valid from the point of view of scientific nomenclature.

XXI. To give the etymology of new generic names and also of specific names when the meaning of the latter is not obvious.

XXII. To indicate precisely the date of publication of their works and that of the placing on sale or the distribution of named and numbered plants when these are accompanied by printed diagnoses. In the case of a work appearing in parts, the last published sheet of a volume should indicate the precise dates at which the different fascicles or parts of the volume were published, as well as the number of pages in each.

XXIII. When works are published in periodicals to require the editor to indicate on the separate copies the date (year and month) of publication and also the title of the periodical from which the work is extracted.

XXIV. Separate copies should always bear the pagination of the periodical of which they form a part; if desired they may also bear a special pagination.

Section 5. On the precision to be given to names by the citation of the author who first published them.

Art. 40. For the indication of the name or names of a group to be accurate and complete, and in order that the date may be readily verified, it is necessary to quote the author who first published the name or combination of names in question.

Examples: *Simarubaceae* Lindley, *Simaruba* Aublet, *Simaruba laevis* Grisebach, *Simaruba amara* Aublet var. *opaca* Engler.

Art. 41. An alteration of the constituent characters or of the circumscription of a group does not warrant the quotation of another author than the one who first published the name or combination of names.

When the changes have been considerable, the words: *mutatis charact.*, or *pro parte*, or *excl. gen.*, *excl. sp.*, *excl. var.*, or some other abridged indication, are added after the citation of the original author, according to the nature of the changes that have been made, and of the group in question.

Examples: *Phyllanthus* L. em. (emendavit) Müll. Arg.; *Myosotis* L. pro parte, R. Br.; *Globularia cordifolia* L. excl. var. β.; etc.

Art. 42. When a manuscript name has been published and referred to its author, the name of the person who published it should be appended to the citation. The same rule should be followed for names of garden origin when they are cited as "Hort."

Examples: *Capparis lasiantha* R. Br. ex or apud DC.; *Streptanthus heterophyllus* Nutt. in Torr. et Gray; *Gesnera Donklarii* Hort. ex or apud Hook. *Bot. Mag.* tab. 5070.

Art. 43. When, in a genus, a name is applied to a group which is moved into another group where it retains the same rank, or to a group which becomes of higher or lower rank than before, the change is equivalent to the creation of a new group and the author who has effected the change is the one to be quoted. The original author can be cited only in parenthesis.

Examples. — *Chieranthus tristis* L. when moved into the genus *Matthiola* becomes *Matthiola tristis* R. Br., or *Matthiola tristis* (L.) R. Br. — *Medicago polymorpha* L. var. *orbicularis* L. when raised to the rank of a species becomes *Medicago orbicularis* All. or *Medicago orbicularis* (L.) All.

Recommendations.

XXV. Authors' names put after names of plants are abbreviated, unless they are very short.

For this purpose preliminary particles or letters that do not, strictly speaking, form part of the name, are suppressed, and the first letters are given without any omission. If a name of one syllable is long enough to make it worth while to abridge it, the first consonants only are given (Br. for Brown); if the name has two or more syllables, the first syllable and the first letter of the following one are taken, or the two first when both are consonants (Juss. for Jussieu; Rich. for Richard). When it is necessary to give more of a name to avoid confusion between names beginning with the same syllables, the same system is to be followed. For instance two syllables are given together with the one or two first consonants of the third; or one of the last characteristic consonants of the name is added (Bertol. for Bertoloni, to distinguish from Bertero; Michx for Michaux, to distinguish from Micheli). Christian names or accessory designations, serving to distinguish two botanists of the same name, are abridged in the same way (Adr. Juss. for Adrien de Jussieu, Gaertn. fil. or Gaertn. f. for Gaertner filius).

When it is a well established custom to abridge a name in another manner, it is best to conform to it (L. for Linnaeus, DC. for De Candolle, St.-Hil. for Saint-Hilaire).

In publications destined for the general public and in titles it is preferable not to abridge.

Section 6. On names that are to be retained when a group is divided, remodelled, transferred, or moved from one rank to another, or when two groups of the same rank are united.

Art. 44. A change of characters, or a revision which involves the exclusion of certain elements of a group or the addition of new elements, does not warrant a change in the name or names of a group, except in cases provided for in article 51.

Examples.— The genus *Myosotis* as revised by R. Brown differs from the original genus of Linnaeus, but the name has not been changed, nor is any change allowable. Various authors have united with *Centaurea Jacea* L. one or two species which Linnaeus had kept distinct; the group thus constituted must be called *Centaurea Jacea* L. (sensu ampl.) or *Centaurea Jacea* L. (em. Visiani, em. Godron, etc.); the creation of a new name such as *Centaurea vulgaris* Godr. is superfluous.

Art. 45. When a genus is divided into two or more genera, the name must be kept and given to one of the principal divisions. If the genus contains a section or some other division which, judging by its name or its species, is the type or the origin of the group, the name is reserved for that part of it. If there is no such section or subdivision, but one of the parts detached contains a great many more species than the others, the name is reserved for that part of it.

Examples. — The genus *Helianthemum* contained, according to Dunal (in DC. *Prodr.* I. 266–284 [1824]), 112 well-known species distributed in nine sections; several of these sections have since been raised to generic rank (*Fumana* Spach, *Tuberaria* Spach) but the name *Helianthemum* has been kept for the divisions grouped round the section *Euhelianthemum*. — The genus *Convolvulus* L. em. Jacq. was divided into two by Robert Brown in 1810 (*Prodr. fl. Nov. Holl.*, p. 482–484), who gave the name *Calystegia* to one

of the genera which at that time contained only four species, and reserved the name *Convolvulus* for the other genus which contained a much larger number of species. — In the same way Salisbury (in *Trans. Linn. Soc.* VI, 317 [1802]), in separating *Erica vulgaris* L. from the genus *Erica*, under the name *Calluna*, kept the name *Erica* for the large number of species left.

Art. 46. When two or more groups of the same nature are united, the name of the oldest is retained. If the names are of the same date, the author chooses, and his choice cannot be modified by subsequent authors.

Examples. — Hooker f. and Thomson (*Fl. Ind.* p. 67 [1855]) united the genera *Wormia* Rottb. and *Capellia* Bl.; they gave the name *Wormia* to the genus thus formed because the last name dates from 1783 while *Capellia* dates from 1825. — In case of union of the two genera *Cardamine* and *Dentaria*, which were founded at the same time by Linnaeus (*Sp. Pl.* ed. 1, p. 653 and 654 [1753]; *Gen. Pl.* ed. 5, n. 726, 727) the collective genus must be called *Cardamine* because that name was chosen by Crantz (*Class. Crucif.*, p. 126 [1769]), who was the first to suggest the union.

Recommendations.

XXVI. Authors who have to choose between two generic names should note the following recommendations:

1. Of two names of the same date to prefer the one which was first accompanied by the description of a species.
2. Of two names of the same date, both accompanied by descriptions of species, to prefer the one, which, when the author made his choice, included the larger number of species.
3. In cases of equality from these various points of view to prefer the more correct and appropriate name.

XXVII. When several genera are united as subgenera or sections under one generic name, that subdivision which was first distinguished or described may retain its name (ex.: *Anarrhinum* sect. *Anarrhinum*; *Hemigenia* sect. *Hemigenia*), or be preceded by a prefix (*Anthriscus* sect. *Eu-Anthriscus*) or followed by a suffix (*Stachys* sect. *Stachyotypus*). These prefixes or suffixes lapse when the subdivisions are raised to generic rank.

XXVIII. When several species are united as subspecies or varieties under a collective name, that subdivision which was first distinguished or described may retain its name (ex.: *Saxifraga aspera* subsp. *aspera*) or bear a prefix (*Alchemilla alpina* subsp. *eualpina*) or be designated by some customary title (*normalis*, *genuinus*, *typicus*, *originarius*, *verus*, *veridicus* etc.). These prefixes or terms lapse when the subdivisions are raised to specific rank.

Art. 47. When a species or subdivision of a species is divided into two or more groups of the same nature, if one of the two forms was distinguished or described earlier than the other, the name is retained for that form.

Examples. — *Genista horrida* DC. *Fl. Franc.* IV. 500 was divided by Spach (in *Ann. Sci. Nat.* ser. 3, II., 253 [1844]) into three species: *G. horrida* DC., *G. Boissieri* Spach and *G. Webbii* Spach; the name *G. horrida* was rightly kept for the earliest described form, that described and figured by Vahl. and Gilibert.— Several species (*Primula cashmiriana* Munro, *P. erosa* Wall.) have been separated from *Primula denticulata* Sm. (*Exot. Bot.* II, 109, tab. 114), but the name *P. denticulata* has been rightly kept for the form which Smith described and figured under this name.

Art. 48. When a subgenus or section or species is moved into another genus, when a variety or other division of a species is moved into another species, retaining there the same rank, the original name of the subgenus or section, the first specific epithet, or the original name of the division of the species must be retained or must be re-established, unless, in the new position there exists one of the obstacles indicated in the articles of section 7.

Examples. — The subgenus *Alfredia* Less. (*Syn.* p. 6, 1832) of the genus *Rhaponticum* keeps its name when placed in the genus *Carduus*: *Carduus* sect. *Alfredia* Benth. et Hook. fil.; the section *Vaccaria* DC. of the genus *Saponaria* keeps its name when placed in the genus *Gypsophila*: *Gypsophila* sect. *Vaccaria* Gren. et Godr. — *Lotus siliquosus* L. *Syst.* ed. 10. p. 1178 (1759) when transferred to the genus *Tetragonolobus* must be called *Tetragonolobus siliquosus* Roth *Tent. Fl. germ.* I. 323 (1788) and not *Tetragonolobus Scandalida* Scop. *Fl. Carn.* ed. 2, II, 87 (1772). — *Betula incana* L. *Suppl.* p. 417 (1781) when transferred to the genus *Alnus* must be called *Alnus incana* Willd. *Sp. Pl.* IV, 335 (1805), not *Alnus lanuginosa* Gilib. *Exerc. Phytol.* II, 402 (1792).— *Satyrium nigrum* L. *Sp. Pl.* ed. 1, 944 (1753), when placed in the genus *Nigritella* must be called *Nigritella nigra* Reichb. f. *Ic. Fl. Germ. et Helv.* XIV, 102 (1851), not *Nigritella angustifolia* Rich. in *Mém. Mus. Par.* IV, 56 (1818). The variety γ *micranthum* Gren. et Godr. (Fl. France, I, 171 [1847]) of *Helianthemum italicum* Pers., when transferred as a variety to *H. penicillatum* Thib. retains its name: *H. penicillatum* var. α *micranthum* Grosser (in Engl. *Pflanzenreich.* Heft. 14, p. 115 [1903]).— The variety *subcarnosa* Hook. fil. (*Bot. Antarct. Voy.* I, 5 [1847]) of *Cardamine hirsuta* L., when transferred as a variety to *C. glacialis* DC., retains its name: *C. glacialis* var. *subcarnosa* O. E. Schulz (in Engl. *Bot. Jahrb.* XXXII, 542 [1903]); the citation of an earlier synonym (*Cardamine propinqua* Carmichael in *Trans. Linn. Soc.* XII, 507 [1818]) has no influence on the choice of the name of the variety (see art. 49). In all these cases, older but incorrect combinations must give place to more recent combinations in which the rule has been observed.

Art. 49. When a tribe becomes a family, a subgenus or a section becomes a genus, a subdivision of a species becomes a species, or the reverse of these changes takes place, and speaking generally when a group changes its rank, the earliest name (or combination of names) received by the group in its new position must be regarded as valid, if it is in conformity with the rules, unless there exist any of the obstacles indicated in the articles of section 7.

Examples. — The section *Campanopsis* R. Br. *Prodr. Fl. Nov. Holl.*, p. 561 (1810) of the genus *Campanula*, was first raised to generic rank by Schrader, and must be called *Wahlenbergia* Schrad. *Cat. hort. Goett.* (1814), not *Campanopsis* O. Kuntze *Rev. Gen.* II, p. 378 (1891). — *Magnolia virginiana* L. var. *foetida* L. *Sp. pl.* ed. 1, p. 536 (1753), raised to specific rank, must be called *Magnolia grandiflora* L. *Syst. Nat.* ed. 10, p. 1082 (1759) not *Magnolia foetida* Sarg. in *Gard. and For.* II, 615 (1889). — *Mentha spicata* L. var. *viridis* L. *Sp. Pl.*, ed. 1, p. 576 (1753) was raised to the rank of a species by Hudson, and must be called *Mentha spicata* Huds. *Fl. angl.* ed. 1, p. 221 (1762) not *Mentha viridis* L. *Sp. Pl.*, ed. 2, p. 804 (1763). — *Lythrum inter-*

medium Ledeb. (*Ind. Hort Dorp.* [1822]), regarded as a variety of *L. Salicaria* L., must be called *L. Salicaria* var. *gracilius* Turcz. (in *Bull. Soc. Nat. Moscou*, XVII, 235 [1844]), not *L. Salicaria* var. *intermedium* Koehne (in Engl. *Bot. Jahrb.* I, 327 [1881]). In all these cases names which are in accordance with the old law of Alphonse de Candolle must give place to older names and combinations.

Recommendations. Authors who make the changes discussed in article 49 should note the following recommendations in order to avoid a change of name in case of a change of rank.

XXIX. 1°. When a sub-tribe becomes a tribe, when a tribe becomes a subfamily, when a subfamily becomes a family, etc., or when the inverse changes occur, do not alter the root of a name but only the termination (*-inae*, *-eae*, *-oideae*, *-aceae*, *-ineae*, *-ales*, etc.), unless, in the new position one of the obstacles indicated in the articles of section 7, supervenes, or the new designation becomes a source of error, or there is some other serious reason against it.

2°. When a section or a subgenus becomes a genus, or the inverse changes take place, retain the old names, unless this results in two genera of plants having the same name, or the existence of two subdivisions of the same name in the same genus, or one of the obstacles indicated in the articles of section 7 supervenes.

3°. When a subdivision of a species becomes a species or the inverse change occurs, retain the original epithets, unless this results in two species bearing the same name in the same genus, or two subdivisions bearing the same name in the same species, or unless any of the obstacles indicated in section 7 supervenes.

Section 7. **On names that are to be rejected, changed or modified.**

Art. 50. No one is authorised to reject, change or modify a name (or combination of names) because it is badly chosen, or disagreeable, or another is preferable or better known, or because of the existence of an earlier homonym which is universally regarded as non-valid, or for any other motive either contestable or of little import. (See also art. 57.)

Examples. — This rule was broken by the change of *Staphylea* to *Staphylis*, *Tamus* to *Thamnos*, *Mentha* to *Minthe*, *Tillaea* to *Tillia*, *Vincetoxicum* to *Alexitoxicon*; and by the change of *Orobanche Rapum* to *O. sarothamnophyta*, *O. Columbariae* to *O. columbarihaerens*, *O. Artemisiae* to *O. artemisiepiphyta*. All these modifications (which are contrary to Art. 50) must be rejected.— The name *Diplomorpha* Meissn. in *Regensb. Denkschr.* III, 289 (1841) must not be substituted for the generic name *Wickstroemia Endl. Prodr. fl. Norfolk.*, p. 47 (1833) because of the earlier homonyms *Wi(c)kstroemia* Schrad. *Goett. gel. Anz.*, p. 710 (1821) and *Wi(c)kstroemia* Spreng. in *Vet. Akad. Handl. Stockh.* 1821, p. 167, t. 3, for the former is merely a synonym of the genus *Laplacea* Kunth (1821) and the latter of a subdivision of the genus *Eupatorium* L. (1753).

Recommendations. See on the subject of homonyms recommendations V*b* and XIV*f* which suggest that cases of this kind should be avoided for the future.

Art. 51. Every one should refuse to admit a name in the following cases:

1. When the name is applied in the plant kingdom to a group which has an earlier valid name.

2. When it duplicates the name of a class, order, family or genus, or a subdivision or species of the same genus, or a subdivision of the same species.

3. When it is based on a monstrosity.

4. When the group which it designates embraces elements altogether incoherent, or when it becomes a permanent source of confusion or error.

5. When it is contrary to the rules of sections 4 and 6.

Examples. — 1°. *Carelia* Adans. (1763) is a name which was applied by its author to a genus which had already received a valid name (*Ageratum* L. [1753]) (*synonym*); similarly *Trichilia alata* N. E. Brown (in *Kew Bull.* [1896] p. 160) is a name which cannot be maintained because it is a synonym of *T. pterophylla* C. DC. (in *Bull. Herb. Boiss.* II, 581 [1894]).— 2°. *Tapeinanthus*, a name given by Boissier to a genus of Labiatae was replaced by *Thuspeinanta* by Th. Durand, because of the existence of an earlier and valid genus, *Tapeinanthus* Herb. among the Amaryllidaceae (*homonym*). Similarly *Astragalus rhizanthus* Boiss. (*Diagn. Pl. Or.* ser. 1, II, 83 [1843]) was renamed *A. cariensis* Boiss. because of the existence of an earlier valid homonym, *Astragalus rhizanthus* Royle *Illustr. Bot. Himal.* p. 200 (1835). — 4°. The genus *Uropedium* Lindl. was based on a monstrosity which is now referred to *Phragmopedilum caudatum* Rolfe. — 5°. The genus *Schrebera* L. derives its characters from the two genera *Cuscuta* and *Myrica* (parasite and host) and must be dropped; and the same applies to *Lemairea* De Vr. which is made up of elements taken from different families. Linnaeus described under the name of *Rosa villosa* a plant which has been referred to several different species and of which certain identification seems impossible; to avoid the confusion which results from the use of the name *Rosa villosa*, it is preferable in this case, as in other analogous cases, to abandon the name altogether.

Art. 52. The name of an order, suborder, family or subfamily, tribe or subtribe, must be changed when it is taken from a genus which, by general consent, does not belong to the group in question.

Examples. — If it were to be shown that the genus *Portulaca* does not belong to the family *Portulacaceae*, the name *Portulacaceae* would have to be changed.— Nees (in Hooker and Arnott, *Bot. Beechey's Voy.* p. 237 [1836]) gave the name *Tristegineae* to a tribe of Gramineae, after the genus *Tristegis* Nees (a synonym of the genus *Melinis* Beauv.). But *Melinis* (*Tristegis*) having been excluded from this tribe by Stapf (in *Fl. Cap.* VII. 313) and by Hackel (in *Oesterr. bot. Zeitcshr.* LI, 464), these authors have adopted the name *Arundinelleae* from the genus *Arundinella*.

Art. 53. When a subgenus, a section or a subsection, passes as such into another genus, the name must be changed if there is already, in that genus, a valid group of the same rank, under the same name.

When a species is moved from one genus into another, its specific epithet must be changed if it is already borne by a valid species of that genus. Similarly when a subspecies, a variety, or some other subdivision of a species is placed under another species, its name

must be changed if borne already by a valid form of like rank in that species.

Examples.— *Spartium biflorum* Desf. (1798–1800) when transferred by Spach in 1849 into the genus *Cytisus* could not be called *Cytisus biflorus*, but was renamed *Cytisus Fontanesii*, because of the previous existence of a valid species *Cytisus biflorus* L'Hérit. (1789). The earliest synonym of *Calochortus Nuttallii* Torr. et Gray (in *Pacific Rail. Rep.* II, 124 [1855–1856]) is *Fritillaria alba* Nutt. (*Gen. Amer.* I, 222 [1818]) but we cannot restore the original epithet of this species, although this has been done in the *Notizbl. des K. bot. Gartens und Mus. Berl.* II, 318 (1899), because there exists already a valid species in the genus with the name *Calochortus albus* Dougl. in Maund *Botanist* t. 98 (1839).

Art. 54. Names of genera must be rejected in the following special cases:

1. When they are formed from a technical term borrowed from morphology, unless they are accompanied by specific names.

2. When they express uninominal nomenclature.

3. When they are formed of two words, unless these two words were from the first united or joined by a hyphen

Examples.— 1°. Generic names such as *Lignum*, *Radix*, *Spina*, etc. would not now be admissible; on the other hand a generic name like *Tuber* should not be rejected when it has been published with specific names (*Tuber cibarium* etc.).— 2°. Ehrhart (*Phytophylacium* [1780] and *Beiträg.* IV, 145–150) made use of a uninominal nomenclature for species known at that time under binary names (*Phaeocephalum*, *Leptostachys*, etc.). These names, which resemble generic names, must not be confused with such and are to be rejected, unless a subsequent author has given them the value of a generic name: for example *Baeothryon*, a uninominal expression of Ehrhart's, has been applied to a genus characterised by A. Dietrich *Spec. Pl.* II, 89 (1833).— 3°. Names like *Quisqualis* (a single word from the first), *Sebastiano-Schaueria* and *Neves-Armondia* will stand.

Art. 55. Specific names must also be rejected in the following special cases:

1°. When they are ordinals serving for purpose of enumeration.

2°. When they merely repeat the generic name.

Examples.— 1°. *Boletus vicesimus sextus*, *Agaricus octogesimus nonus*.— 2°. *Linaria Linaria*, *Raphanistrum Raphanistrum* etc.

Art. 56. In the cases foreseen in articles 51 to 55, the name to be rejected or changed is replaced by the oldest valid name in the group in question, and in default of such a one a new name must be made.

Examples: See the examples cited under articles 51 and 53.

Art. 57. The original spelling of a name must be retained, except in case of a typographic or orthographic error. When the difference

between two names, especially two generic names, lies in the termination, these names are to be regarded as distinct even though differing by one letter only.

Examples: *Rubia* and *Rubus*, *Monochaete* and *Monochaetum*, *Peponia* and *Peponium*, *Iria* and *Iris*.

Recommendations.

XXX. The liberty of making orthographic corrections must be used with reserve, especially if the change effects the first syllable, and above all the first letter of a name.

XXXI. Many names differ by a single letter without risk of confusion (ex. *Durvillea* and *Urvillea*). In cases where a close approach to identity is a source of error (ex. *Astrostemma* and *Asterostemma* in one and the same family, *Asclepiadaceae*, *Pleuripetalum* and *Pleuropetalum* in *Orchidaceae*) only one, the older, of the names should be kept, in accordance with article 51, 4°.

Chapter IV. **Modifications of the rules of botanical nomenclature.**

Art. 58. The rules of botanical nomenclature can only be modified by competent persons at an international Congress convened for the express purpose.

Appendix. **Various Recommendations.**

XXXII. Botanists should use in modern languages latin scientific names or those immediately derived from them, preferably to names of another kind or origin. They should avoid the use of the latter unless these are very clear and in common use.

XXXIII. Every friend of Science should oppose the introduction into a modern language of names of plants which are not already there, unless they are derived from latin botanical names by means of some slight alteration.

XXXIV. The metric system only is used in botany for reckoning weights and measures. The foot, inch, line, pound, ounce etc. should be rigorously excluded from scientific language.

Altitude, depth, rapidity etc. are measured in metres. Fathoms, knots, miles etc. are expressions which should disappear from scientific language.

XXXV. Very minute dimensions are reckoned in μ (micromillimetres, microns, or thousandths of a millimetre) and not in fractions of a millimetre or line, etc.; fractions encumbered with ciphers and commas are more likely to give rise to mistakes.

XXXVI. Authors are asked to indicate clearly and precisely the scale of the figures which they publish.

XXXVII. Temperatures are expressed in degrees of the centigrade thermometer of Celsius.

New England Genera of which the long established Names are to be maintained notwithstanding technical Lack of Priority.

(Extracted from a list of about 400 such generic names sanctioned by act of the International Botanical Congress at Vienna.)

Names to be retained	Names to be discarded.
Tragus [Hall. (1768)] Scop. (1777)	Nazia Adans. (1763)
Leersia Sw. (1788)	Homalocenchrus Mieg (1760)
Hierochloe [J. G. Gmel. (1747)] R. Br. (1810)	Savastana Schrank (1789)
	Torresia Ruiz & Pav. (1794)
	Dissarrenum Labill. (1806)
Cynodon L. C. Rich. (1805)	Capriola Adans. (1763)
	Dactilon Vill. (1789)
	Fibichia Koel. (1802)
Ctenium Panz. (1814)	Campulosus Desv. (1810)
Glyceria R. Br. (1810)	Panicularia Fabr. (1763)
Fimbristylis Vahl (1806)	Iria L. C. Rich. (1805)
	Iriha O. Ktze. (1891)
Rhynchospora Vahl (1806)	Triodon L. C. Rich. (1805)
Symplocarpus Salisb. (1818)	Spathyema Raf. (1808)
Heteranthera Ruiz & Pav. (1794)	Phrynium Loefl. (1758)
Luzula DC. (1805)	Juncoides [Moehr. ex] Adans. (1763)
Smilacina Desf. (1807)	Vagnera Adans. (1763)
	Tovaria Neck. (1790)
	Polygonastrum Moench (1794)
Majanthemum Web. (1780)	Unifolium [Moehr. (1736)] Adans. (1763)
	Valentinia Heist. (1763)
Lachnanthes Ell. (1816)	Heritiera J. F Gmel. (1791)
	Gyrotheca Salisb. (1812)
Belamcanda Adans. (1763)	Gemmingia Heist. (1763)
Platanthera L. C. Rich. (1818)	Lysias Salisb. (1812)
Spiranthes L C. Rich (1818)	Gyrostachis Pers. (1807)
	Ibidium Salisb. (1812)
Listera R. Br. (1813)	Diphryllum Raf. (1808)
Calopogon R. Br. (1813)	Cathea Salisb. (1812)
Liparis L. C. Rich.	Leptorkis Thou. (1809)
Carya Nutt. (1818)	Scoria Raf. (1808)
	Hicorius Raf. (1817)
	Hicoria Raf. (1838)

Maclura Nutt.	Toxylon Raf. (1817)
	Joxylon Raf. (1818)
Laportea Gaudich. (1826)	Urticastrum Fabric. (1759)
Pilea Lindl. (1821)	Adicea Raf. (1815)
Arceuthobium Marsch.-Bieb.(1819)	Razoumowsk a Hoffm. (1808)
Fagopyrum [Tourn. ex] Moench (1794)	Helxine L. (1753)
Suaeda Forsk. (1775)	Dondia Adans. (1763)
	Lerchea [Hall. (1743)] Rueling (1774)
Spergularia J. & C. Presl. (1819)	Buda Adans. (1763)
	Tissa Adans. (1763)
Dicentra Bernh. (1833)	Capnorchis Borckh. (1797)
	Bikukulla Adans. (1763)
	Diclytra Borckh. (1797)
	Die'ytra Cham. & Schlechtd. (1826)
	Dactylicapnos Wall. (1826)
Corydalis Medik. (1803)	Capnoides Adans. (1763)
	Cisticapnos Adans. (1763)
	Neckeria Scop. (1777)
	Pseudofumaria Medik. (1789)
Capsella Medik. (1792)	Bursa Siegesb. Weber (1780)
	Marsypocarpus Neck (1790)
Erophila DC. (1821)	Gansblum Adans. (1763)
Physocarpus Maxim. (1879)	Opulaster Medik. (1799)
Sorbaria A. Br. (1864)	Basilima Raf. (1836)
	Schizonotus Lindl. (1829)
Tetragonolobus Scop. (1772)	Scandalida Adans. (1763)
Tephrosia Pers. (1807)	Cracca L. (1747, 1753)
	Colinil Adans. (1763)
	Needhamia Scop. (1777)
Oxytropis DC. (1802)	Spiesia Neck. (1790)
Desmodium Desv. (1813)	Meibomia Adans. (1763)
	Pleurolobus J. St. Hil. (1812)
Amphicarpaea Ell. (1818)	Falcata J. F. Gmel. (1791)
	Savia Raf. (1808)
Ailanthus Desf. (1789)	Pongelion Adans. (1763)
Nemopanthus Raf. (1819)	Ilicioides Dumont de Courset. (1802)
Shepherdia Nutt. (1818)	Lepargyrea Raf. (1818)
Bifora Hoffm. (1816)	Anidrum Neck. (1790)
Cryptotaenia DC. (1829)	Deringa Adans. (1763)
	Alacospermum Neck. (1790)
Loiseleuria Desv. (1840)	Chamaecistus Oeder. (1761)
Gaylussacia HBK. (1818)	Adnaria Raf. (1817)

Halenia Borkh. (1796)
Calystegia R. Br. (1810)
Ellisia L. (1763)
Amsinckia Lehm. (1831)
Mertensia Roth. (1797)
Pycnanthemum L. C. Rich. (1803)

Nicandra Adans. (1763)

Epiphegus Nutt. (1818)
Fedia Moench (1794)
Echinocystis Torr. & Gray (1840)
Vernonia Schreb. (1791)
Mikania Willd. (1803–1804)

Liatris Schreb. (1791)

Chrysopsis Ell. (1824)
Haplopappus Cass. (1828)
Silybum Adans. (1763)
Cnicus Gaertn.[1] (1791)
Krigia Schreb. (1791)
Taraxacum Wiggers (1780)

Tetragonanthus S. G. Gmel. (1769)
Volvulus Med k. 1791)
Macrocalyx Trew (1761)
Benthamia Lindl. (1830)
Pneumaria Hill (1764)
Furera Adans. (1763)
Koellia Moench (1794)
Pentagonia Heist. ex Fabr. (1759)
Physaloides Boehm. (1760)
Leptamnium Raf. (1818)
Mitrophora Neck. (1790)
Micrampelis Raf. (1808)
Behen Hill (1762)
Willugbaeya Neck. (1790)
Carelia Cav. (1802)
Laciniaria Hill (1762)
Psilosanthus Neck. (1790)
Diplogon Raf. (1818)
Hoorebeckia Cornelissen (1817)
Mariana Hill (1762)
Carbenia Adans. (1763)
Adopogon Neck. (1790)
Hedypnois Scop. (1772)

[1 It should be noticed that this ruling is to the effect that the name *Cnicus*, employed by Linnaeus for a considerable aggregate, should be restricted, as by Gaertner, to *Cnicus benedictus* and any plants regarded as congeneric with it. As a result our ordinary thistles with plumose pappus may bear the name *Cirsium* Adans., and the species with simple pappus the name *Carduus* L. The degree to which the latter groups may be regarded as separate genera is of course still a matter of individual opinion.— Ed.]

NOTES ON NEW ENGLAND HEPATICAE, —V.

ALEXANDER W. EVANS.

(Plate 73.)

Of the species noted below the first three are introduced for nomenclatorial reasons. The paper also records additions to the hepatic flora of each New England state except Rhode Island. The majority of these additions belong to either *Lophozia* or *Calypogeia*, one species in the latter genus being elevated from varietal rank. For the sake of comparison the two species of *Calypogeia* already known from New England are also discussed. The reasons for discarding the generic name *Kantia* in favor of *Calypogeia* are stated by the writer in another connection.[1]

1. **Ricciella Sullivantii** (Aust.) comb. nov. *Riccia Sullivantii* Aust. Proc. Acad. Nat. Sci. Phil. 1869: 233. *Riccia fluitans*, var. *Sullivantii* Aust.; Underwood, Bull. Illinois State Lab. Nat. Hist. **2**: 28. 1884. *Riccia Huebeneriana* Underw. Bot. Gazette **19**: 276. 1894 (not Lindenb.). The genus *Ricciella* was proposed by A. Braun in 1821[2] for the reception of *Riccia fluitans* L. and *Riccia canaliculata* Hoffm., both of which are now considered forms of the same species. It was based on the fact that the capsules protruded from the lower surface of the thallus, instead of from the upper, as in more typical species of *Riccia*. For a long time it received but slight recognition, although both Trevisan and Dumortier accepted it without question. It has also been accepted by Stephani, at first as a genus and afterwards as a subgenus under *Riccia*.[3] Instead, however, of relying upon the original characters of Braun, he bases his division on differences in the structure of the thallus. In *Riccia* proper, as he defines it, the photosynthetic layer consists of rows of cells extending at right angles to the epidermis; these are loosely connected longitudinally and enclose air chambers in the form of narrow canals. In *Ricciella* the air chambers are more irregular and are separated by plates of cells. Warnstorf[4] adopts *Ricciella* as a genus on the basis of Stephani's characterization, a procedure which seems to be entirely

[1] Bryologist **10**: 24–30. 1907.
[2] Flora **4**: 756. 1821.
[3] Bull. de l'Herb. Boissier I. **6**: 361. 1898.
[4] Kryptogamenfl. der Mark Brandenburg **1**: 80. 1903.

warranted. In addition to *R. Sullivantii* two other species of *Ricciella* are known from New England, namely, *R. crystallina* (L.) Warnst. and the type of the genus, *R. fluitans* (L.) A. Br. *R. crystallina* has been found in Connecticut only, but the other two have been reported from each New England state except New Hampshire.

2. **Marsupella Sullivantii** (DeNot.) comb. nov. *Sarcoscyphus sphacelatus*, var. *medius* Gottsche (in part), 1860. *S. Sullivantii* De Not., 1861. *S. Ehrharti*, var. *erythrorhizus* Limpr., 1876. *Marsupella erythrorhiza* Schiffn., 1901. *M. media* Schiffn. (as synonym), 1901.[1] The 49th Article of the Vienna Rules of Nomenclature[2] includes the following statement: when....a subdivision of a species becomes a species....the earliest name received by the group in its new position must be regarded as valid. Applying this rule to the present species it is perfectly evident that *Sarcoscyphus Sullivantii* was the earliest name received by Gottsche's var. *medius* of *S. sphacelatus*, upon its elevation to specific rank. The name *Sullivantii* must therefore be regarded as valid and must be retained when the species is transferred to *Marsupella*. Precisely the same conclusion would be reached by applying the American Association Code of Botanical Nomenclature as recently revised. Specimens of *M. Sullivantii* have recently been received from various localities in the White Mountains, New Hampshire (*W. G. Farlow*), and from Southington, Connecticut (*Miss Lorenz*). It has not yet been reported, however, from either Vermont or Rhode Island.

3. Nardia Geoscyphus (De Not.) Lindb.; Carrington, British Hepat. 27. 1874. *Jungermannia scalaris β minor* Nees, Naturgeschichte der europ. Leberm. **1**: 281. 1833. *Alicularia scalaris β minor* Nees, l. c. **2**: 449. 1836. *Jungermannia haematosticta* Nees, l. c. **2**: 453 (in note). 1836. *Alicularia Geoscyphus* De Not. Mem. R. Accad. Sci. di Torino II. **18**: 486. *f. III (1–13)*. 1859. *Jungermannia Silvrettae* Gottsche; G. & R. Hep. Eur. Exsic. *470*. 1869 (without description). *Nardia repanda* Lindb.; Carrington, British Hepat. 27. 1874 (not *Jungermannia scalaris β repanda* Hüben. Hep. Germ. 81. 1834). *Marsupella Silvrettae* Dumort. Hep. Europ. 128. 1874. *Alicularia minor* Limpr.; Cohn, Kryptogamenfl. von Schlesien **1**: 251. 1876. *Nardia haematosticta* Lindb. Musc. Scand. 8. 1879.

[1] For fuller references and additional synonyms see the writer's earlier notes on *Marsupella media* in Rhodora **6**: 167. 1904.

[2] International Rules of Botanical Nomenclature adopted by the International Botanical Congress of Vienna 1905. Jena, 1906.

N. insecta Lindb. l. c. *Jungermannia dovrensis* Limpr. Jahresb. Schlesischen Ges. für vaterl. Cultur **61**: 10. 1884. *Nardia minor* Arn. Lebermoosstudien im nordl. Norwegen 39. 1892. *N. Silvrettae* Pears. Hepat. British Isles 372. *pl. 172.* 1901. *Mesophylla minor* Corb.; Bouvet, Bull. Soc. d'Étud. Scient. d'Angers for 1902: 189. 1903. Judging from the above synonymy the specific name *haematosticta* is apparently available for the present species, and Lindberg's combination *Nardia haematosticta* has been rather extensively adopted.[1] *Jungermannia haematosticta* Nees, however, was never effectively published by its author, according to either the Vienna Rules or the Association Code, both of which state that incidental mention of a name is not publication. The note referred to in which the name appears is given under *Alicularia scalaris β minor* and states that Nees von Esenbeck had formerly sent specimens of this variety to his friends under the name *Jungermannia haematosticta*. This cannot be considered as anything more than incidental mention, even though the implication is made that the plant might perhaps be regarded as worthy of specific rank. The name must therefore be discarded, and the species must bear the later name *Geoscyphus* of De Notaris, according to the 49th Article of the Vienna Rules. As originally proposed this name had a substantive form and did not agree in gender with the generic name *Alicularia*. Some of the later writers who have used it have changed it to an adjective form, but this course can hardly be warranted. It should also be noted that Trevisan[2] published the combination *Nardia Geoscyphus* in the same year as Lindberg, but apparently later in the year because Massalongo[3] quotes Lindberg rather than Trevisan as the author of the name. According to Stephani[2] *Alicularia Rotaeana* De Not. (Mem. R. Accad. Sci. di Torino II. **18**: 484. *f. II* [*1–14*]. 1859) is also a synonym of the present species,[2] but Massalongo[4] considers it a form of *Nardia scalaris* (Schrad.) S. F. Gray instead, and the figures of De Notaris certainly give strong support to this latter view. *Nardia Geoscyphus* was first recorded as a New England plant from specimens collected along the Crawford Bridle Path in the White Mountains. It has

[1] A full description of the species under this name was published by the writer in Proc. Wash. Acad. **2**: 296. 1900. See also RHODORA **4**: 209. 1902; and **5**: 172. 1903.

[2] Rend. R. Ist. Lomb. di Sci. e Lett. II. **2**: 784. 1874.

[3] Ann. R. Ist. Bot. di Roma **3**: (5). 1888.

[4] Bull. de l'Herb. Boissier II. **2**: 40. 1902.

since been found at Franconia, New Hampshire (*W. G. Farlow*), and at West Newbury, Massachusetts (*Miss Haynes*). The lowland specimens bear leaves which are more or less bilobed and therefore represent the *Nardia insecta* of Lindberg. European writers, however, do not consider this plant a distinct species at the present time.

4. Lophozia confertifolia Schiffn. Oesterr. Bot. Zeitschr. **55**: 47. 1905. Mt. Katahdin, Maine (*Cowles Party, 20*). Determination confirmed by Schiffner.[3] The species is apparently confined to alpine regions, where it grows on peaty soil or on stones covered with earth. Until the present time it was known from only four European localities, three in Austria and one in Switzerland, and its detection in New England is therefore of considerable interest. *L. confertifolia* belongs to the *ventricosa*-group, and its author compares it with *L. alpestris* (Schleich.) Evans and *L. Wenzelii* (Nees) Steph. It is characterized by its densely tufted habit and by the fact that its leaves are closely imbricated and concave. Its color is a dull green, more or less tinged with brown or red. The leaves are broadly elliptical and bifid one third or less with a lunulate to obtuse sinus and broad obtuse or subacute lobes. The leaf-cells have small but distinct triangular trigones and their walls are otherwise thin though often pigmented. In the middle of the leaf the cells average about 23 μ in diameter, agreeing in this respect with the cells in *L. ventricosa* but being considerably larger than those of *L. alpestris*. The Maine specimens agree closely with those distributed by Schiffner.

5. Lophozia longidens (Lindb.) Macoun, Cat. Canadian Pl. **7**: 18. 1902. *Jungermannia porphyroleuca* Γ *attenuata* Nees, Naturgeschichte der europ. Leberm. **2**: 80. 1836. *Jungermannia longidens* Lindb. Musc. Scand. 7. 1879. Streaked Mountain, Hebron, Maine (*J. A. Allen, 5*). Chocorua (Whidden's Pond), Mt. Adams and Mt. Pemigewasset, New Hampshire (*W. G. Farlow*). The Chocorua specimens were determined by Schiffner. *L. longidens* was first recorded as a North American species by Macoun, who found it on wet rocks in the Smoky Mountains of Cape Breton, Nova Scotia. It has a wide distribution in Europe and has also been collected in Siberia. Schiffner considers it one of the most clearly marked members of the *ventricosa*-group, but Stephani looks upon it as a simple synonym of *L. ventricosa*. The writer is disposed to accept

[3] See Oesterr. Bot. Zeitschr. **56**: 26. 1906. Both the present species and the following are here recorded from New England for the first time.

the opinion of Schiffner. *L. longidens* grows in rather loose tufts and is either dull green in color or more or less tinged with brown or yellow. It is more delicate in texture than most of its allies, the leaf-cells being thin-walled except for their minute trigones. The leaves are ovate-quadrate or ovate-rectangular in outline and are bifid one third or less with an obtuse sinus. The divisions of the leaves are narrowly triangular and acute, rarely diverging from each other to any extent. The species rarely fruits but usually develops gemmiparous branches which are among its most striking features. These branches are ascending or erect and their crowded leaves are almost transversely attached. They spread obliquely from the axis but are frequently squarrose in the outer part. The gemmae are borne in small clusters at the tips of the lobes; they are globoid or short-ellipsoid in form, sometimes with obscure angles, and are either unicellular or bicellular. In color the gemmae are normally reddish brown, but the New Hampshire specimens bear green gemmae and Schiffner states that he has observed a similar condition among European specimens. Probably the lack of pigmentation in these cases is due to the fact that the plants were deeply shaded. *L. longidens* seems to attain its best development on rocks but it also occurs on logs; it is apparently confined to alpine or subalpine localities.

(*To be continued.*)

QUERCUS PRINOIDES WILLD. VAR. RUFESCENS VAR. NOV.

ALFRED REHDER.

IN the spring of 1903 Mr. F. G. Floyd drew my attention to a peculiar shrubby Oak he had discovered the year before on the island of Nantucket. I subsequently visited the island myself and found the shrub in question in the locality indicated by Mr. Floyd. It grows there in the low thickets of Scrub Oak consisting of *Quercus prinoides* and *ilicifolia* and covering a large part of the higher rolling land between Nantucket and Siasconset, but occurs only as scattered bushes between the other Oaks. In general appearance it resembles most the *Q. prinoides*, but differs in the villous and rufous or rather fulvous pubescence which covers the under side of the leaves and

the young branches. This pubescence and the locality suggested at first sight a possible cross between *Q. prinoides* and *ilicifolia*, but as all the other characters of the form are those of *Q. prinoides*, this idea had to be abandoned; moreover, no cross has as yet been observed between a Black and a White Oak. No mention of a *Q. prinoides* with the pubescence described could be found in literature, but in looking through the Gray Herbarium and the herbaria of the Arnold Arboretum and of the New England Botanical Club I found at least two specimens which undoubtedly belonged to this form, one from Cape Cod and one from the Pine barrens of New Jersey so that it may be considered a coast form of *Q. prinoides*, and as it differs also in a few other characters from the type, it seems to deserve a varietal designation and may be distinguished as

QUERCUS PRINOIDES Willd. var. **rufescens** var. nov.

A typo recedit foliis subtus non solum albo-tomentosis sed etiam fulvescenti-villosis praecipue secus costam mediam ramulisque hornotinis fulvescenti-pubescentibus, foliorum lobis acutiusculis mucrone calloso instructis, etiam foliis obovatis quam ea formi typici omnino minoribus et latioribus saepe undulatis.

The variety differs from the type in the leaves having beneath besides the close white tomentum a woolly yellowish pubescence particularly along the m drib and in the branches being pubescent at least when young. The leaves are generally smaller are broader and obovate with acutish callous-tipped lobes and often undulate margin.

MASSACHUSETTS: Nantucket Island, between Nantucket and Siasconset, Sept. 1902, *F. G. Floyd*; August 29, 1903, *Alfred Rehder*; Cape Cod, Centreville, damp woods, July 14, 1903, *Clara Imogene Cheney*; NEW JERSEY: Pine barrens of Manchester, August 26, 1852, *A. C. Hexamer*. The following specimens must also be referred to this variety, though they are somewhat deviating from its type. New Jersey, Pine barrens (Herb. Gray) differs in its larger leaves; Massachusetts, Jamaica Plain, 1887, *C. E. Faxon*, has leaves with a slighter villous pubescence; North Carolina, Dunsmore, Buncombe Co., September 21, 1897, *Biltmore Herb.* No. 828^b, has less villous and longer and narrower leaves and comes from the mountains of western North Carolina.

The typical *Quercus prinoides* has the generally larger and often oblong-obovate or even oblong leaves more gradually narrowed toward the apex and covered beneath with a close whitish tomentum, which is sometimes reduced to scattered stellate hairs; the branchlets

are glabrous. Intermediate forms between the species and the variety are in Nantucket always associated with plants representing the type of the variety.

ARNOLD ARBORETUM.

AN INTERESTING LOCALITY.

E. B. HARGER.

PISTAPAUG (or PAUG) POND is a natural pond of manifest glacial origin, about three-fourths of a mile long and a third as broad lying at the intersection of the four towns of North Branford, Guilford, Wallingford and Durham about twelve miles northeasterly from New Haven, Connecticut. It is mostly within the limits of Wallingford and Durham about one-half in each. On the east of the pond (the Durham side), one of the characteristic trap-ridges of the region, known as Pistapaug Mountain rises from the water's edge more than 200 feet above the pond which itself is at an elevation of some 400 feet above sea level. To the northwest is another trap hill; and a highway skirts closely the northern border of the pond and runs through the pass between the two hills. Westward is a broad tract of cleared land and to the south lie low wooded hills, where doubtless runs the old valley now dammed with glacial drift.

In the spring of 1903 I found in the Eaton Herbarium at New Haven a specimen of *Polymnia Canadensis* L., collected in 1880 by Prof. O. D. Allen and labeled "Trap slide near Paug Pond, Durham, "Conn." I immediately formed the resolution of exploring the region, but had no opportunity of doing so until Sept. 15, 1905. On this trip, almost at the first sight of a "trap slide" I found the *Polymnia*, but on the Wallingford side of the pond. However, on crossing to the slopes of Pistapaug Mountain I found the plant in great abundance, both near the foot and near the top of the talus-slope, which here runs directly into the water. The remoteness of the locality from houses and the extent of territory over which the plant is spread seem to indicate that is not of recent introduction, but may be considered native to Connecticut.

Although the main object of the trip was fulfilled by the re-discovery of *Polymnia*, the further results were very gratifying. At the base

of the mountain, east of the head of the pond, were found two small patches of *Arenaria macrophylla* Hook., the second station in the state. Mr. Bartlett's station (RHODORA 7: 20) is five or six miles distant. Near the *Arenaria* grow *Phegopteris Dryopteris* Fée. and *Stellaria borealis* Bigelow, and a short distance south I found a quantity of *Pyrus Americana* DC. in full fruit, perhaps the most southerly station in the state. From the pond itself I collected *Bidens Beckii* Torr., *Potamogeton praelongus* Wulf. and *Heteranthera graminea* Vahl., the last in good flower. By the roadside, perhaps one-fourth of a mile west, a colony of *Cuphea viscossissima* Jacq. reached the best development that I have noted in this state.

As on the first trip I had only about two hours for exploration, the results seemed to justify another expedition, which was undertaken, in company with Prof. A. W. Evans, on May 30, 1906. On reaching the station noted above for *Cuphea*, we found a pool near by which was covered with a profusion of *Hottonia inflata* Ell. in flower. A little farther on in a small bog we found a few plants of *Epilobium strictum* Muhl., growing with a sedge, which later investigation showed to be *Carex brunnescens* (Pers.) Poir., and in cleared ground at the head of the pond, a quantity of *Hieracium floribundum* Wimm. &. Grab. a species which has only recently been reported from the state but seems to be spreading. After searching in vain for the *Arenaria* I climbed the cliff to the top of the mountain, while Prof. Evans searched for *Hepaticae* on the slopes. I was rewarded for the rather stiff climb by the discovery of *Carex eburnea* Boott, a species previously known from Connecticut only from the limestone region of Litchfield County and from the neighborhood of Southington. Later we found *Lycopodium annotinum* L., on the borders of a swamp a few hundred feet north of the pond, an extension of range southeasterly of some forty miles. Here were also *Cornus Canadensis* L. and *Clematis verticillaris* DC. After tracing the *Polymnia* some quarter of a mile northerly from the place where it was found in September, we left the locality.

In addition to the plants noted above a peculiar gooseberry was found on the first expedition, which, after comparison at New Haven and at the Gray Herbarium, was thought to be *Ribes lacustre* Poir., and was so reported at the winter meeting of the Connecticut Botanical Society. On collection of flowers and young fruit it proved to be a form of *R. oxyacanthoides* L. peculiar in its almost spineless but

densely weak-prickly or hispid semi-prostrate stems, which seldom use more than 2–3 dm. above the ground.

OXFORD, CONNECTICUT.

POLYTRICHUM GRACILE DICKS. IN MAINE.— In one of the wooded swamps at Middle Dam, Rangeley Lakes, Maine, there was found in Sept., 1906, one small clump of Polytrichum with leaves resembling those of *Catharinea angustata*. Prof. J. Franklin Collins, to whom the moss was sent, determined it as *P. gracile* Dicks. According to him, it is not the typical form, but agrees with one of the variations noted in Dixon and Jameson's Handbook of British mosses. The leaf-margins are about three times wider than in the type, and the lamellae are only three cells high instead of four or five. Prof. Collins has not been able to learn of any previous collection of this species in Maine.— ELIZABETH MARIE DUNHAM.

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NOTES ON NEW ENGLAND HEPATICAE,—V.

ALEXANDER W. EVANS.

(Plate 73.)

(*Continued from p. 60.*)

6. CALYPOGEIA SPHAGNICOLA (Arn. & Perss.) Warnst. & Loeske, Verhandl. Bot. Ver. Prov. Brandenburg **47**: 320. 1905. *Kantia sphagnicola* Arn. &. Perss. Rev. Bryol. **29**: 26. *f. 1–8.* 1902. *Cincinnulus Trichomanis*, var. *sphagnicola* Meylan, Bull. de l'Herb. Boissier II. **6**: 499. 1906. In tufts of *Dicranum Bergeri* growing in a bog; New Milford, Connecticut (*A. W. E.*). The present species was first described from Swedish specimens but has since been collected in Scotland, in Austria, in Switzerland, and apparently in northern Germany. The New England plants agree closely with the type material, and the writer's determination has been confirmed by Macvicar. *C. sphagnicola* is close to *C. Trichomanis* but differs from it in a number of respects and is apparently worthy of specific rank. Even when well developed it is a small species and is pale green in color, slightly tinged with yellow. The leaves are imbricated and spread from the axis at an angle of about 45 degrees, which is considerably less than in *C. Trichomanis.* They are distinctly convex, the apex being frequently revolute, and they are usually 0.85–1 mm. long and 0.6–0.7 mm. wide. The postical base is normally rounded and abruptly short-decurrent, and the apex varies from obtuse to rounded or slightly emarginate. The leaf-cells average about 40 × 27 μ and develop small but distinct trigones; these are usually triangular in outline with straight or concave sides but are sometimes

more nearly circular, the sides being convex. The orbicular or ovate-orbicular underleaves average about 0.35 mm. in length and give rise to a great abundance of long rhizoids. They are bifid to the middle or a little beyond with a blunt sinus and the divisions are erect or slightly divergent and obtusely pointed. In rare instances one of the divisions bears a blunt supplementary lobe on the outside. The inflorescence is described as autoicous. The small size of the plants, the angle at which the leaves spread, the distinct trigones, and the deeply bifid underleaves usually make it easy to distinguish the species from *C. Trichomanis*. Unfortunately etiolated stems are often developed in which the leaves are long-decurrent and the trigones scarcely apparent. Such stems might be the source of considerable confusion, if they were not always associated with normal stems in which the true characters of the species were well shown.

7. CALYPOGEIA SUECICA (Arn. & Perss.) C. Müll. Frib. Beih. zum Bot. Centralbl. **17**: 224. 1904. *Kantia suecica* Arn. & Perss. Rev. Bryol. **29**: 29. *f. 1–6.* 1902. *Cincinnulus suecicus* C. Müll. Frib. Beih. zum Bot. Centralbl. **13**: 98. 1902. *Cincinnulus Trichomanis*, var. *suecicus* Meylan, Bull. de l'Herb. Boissier II. **6**: 499. 1906. On rotten logs. Mt. Katahdin, Maine (*Cowles Party, 33*).[1] Stafford, Connecticut (*G. E. Nichols*). Since the original publication of this species from Swedish specimens it has been reported from Scotland, France, Germany, Austria and Switzerland. As in the case of *C. sphagnicola*, however, this is the first record for North America. The New England specimens have been compared with a portion of the type material with which they agree closely. *C. suecica* seems to be confined to rotten logs and is often found in company with such species as *Cephalozia lunulaefolia, Riccardia latifrons* and *Lophozia porphyroleuca*. It bears a strong resemblance to *C. Trichomanis* but is considerably smaller, being of about the same size as *C. sphagnicola*. The leaves are convex and occasionally revolute at the apex; they spread obliquely from the axis at about the same angle as in *C. Trichomanis* and therefore more widely than in *C. sphagnicola*. The leaves are triangular-ovate in outline and their apices are very variable, being normally rounded but frequently truncate or bidentate, both teeth and sinus varying from acute to rounded. The leaf-cells are small, averaging about 30 μ in diameter, and in the outer part of the leaf are characterized by distinct trigones, triangular in outline with

[1] Harvey (RHODORA **5**: 51. 1903) has listed these specimens as *Kantia Trichomanis* from an earlier determination by the writer.

straight or slightly convex sides. The underleaves are relatively large and frequently imbricated, averaging about 0.45 mm. in length and from 0.45–0.6 mm. in width. They are broadly orbicular and bifid to the middle or beyond with an acute sinus and acute or obtuse lobes. Sometimes the lobes are entire but it is more usual for them to bear a blunt supplementary tooth on the outside, and occasionally a second tooth of this character is to be observed. The inflorescence seems to be constantly dioicous. In distinguishing the species from *C. Trichomanis* the small size, the variable leaves, the small leaf-cells with trigones, and the deeply bifid underleaves afford the most trustworthy differential characters. The peculiar habitat of the plant should also be kept in mind.

8. CALYPOGEIA SULLIVANTII Aust. Hep. Bor.-Amer. *74b*. 1873. *Kantia Sullivantii* Underw. Bot. Gaz. **14**: 196. 1889. The type material of *C. Sullivantii* came from Alabama but the species was also known to Austin from New Jersey. It has since been recorded from Massachusetts, Rhode Island, and Connecticut and the writer has lately received specimens from North Carolina and Arkansas. It evidently replaces the European *C. arguta* in North America and is very different from the other species noted in the present paper. Since the published descriptions are incomplete, a fuller account of the species, with figures, may perhaps be of service.

The plants grow scattered or in very loose mats and vary in color from a pale yellowish green in exposed localities to a deeper green in the shade. The stems are prostrate and sparingly branched. They are somewhat flattened and show a distinction between the cortex, which is composed of a single layer of enlarged cells, and the median region, which is made up of a mass of smaller cells about four cells wide and three cells thick. The cortical cells are commonly arranged in ten longitudinal rows, four antical, four postical, and one lateral on each side (*f. 3*). The postical cells are a little larger than the antical, but the lateral cells surpass both in size, measuring from 45–70 μ in length and about 45 μ in width. They give the stem the appearance of being narrowly winged. The leaves are attached to these long cortical cells for about three fourths their width, the line of insertion curving at its apical end to the middle of the antical surface of the stem (*f. 4*). A similar stem-structure is found in *C. arguta* and also in the Hawaiian *C. bifurca* Aust.;[1] it bears a strong resemblance to the

[1] Proc. Acad. Nat. Sci. Phil. 1869: 223. See also C. M. Cooke, Jr., Trans. Conn. Acad. **12**: 26. *pl. 9, f. 1–10.* 1904.

structure of the midrib in *Metzgeria* and in the remarkable South American genus *Pteropsiella* as described and figured by Spruce.[1]

The leaves are usually small and rudimentary at the base of a stem or branch, then increase rapidly in size toward the middle and become smaller again toward the apex. They vary from distant to loosely imbricated and spread widely from the axis, sometimes at nearly a right angle. In the median region, where they are most normally developed, they are ovate to broadly ovate in outline, 0.75–1.2 mm. long, 0.6–0.85 mm. wide, and plane or nearly so. The postical margin is usually a little more curved than the antical and either meets the axis at a wide angle or is short-decurrent. The leaves gradually narrow out toward the apex, which is uniformly bidentate with sharp parallel teeth separated by an obtuse to lunulate sinus. The teeth are usually three or four cells long and two cells wide at the base, but these numbers are subject to some variation (*f. 5, 6*). The leaf-cells are large, averaging about 60 × 40 μ, but there is usually a sharp contrast between them and the lateral cortical cells, since the long axes of the latter extend in a different direction. The walls of the cells are either thin throughout or uniformly thickened and do not show distinct trigones. The free walls on both leaf-surfaces are characterized by being minutely verruculose, the walls in the other New England species being smooth throughout.

The underleaves are distant and minute, measuring about 0.2 mm. in length and 0.25 mm. in width. They are sometimes appressed to the axis, sometimes more or less spreading and sometimes completely reflexed and give rise to a large number of long rhizoids. They are rectangular or trapezoidal in outline and deeply bifid with a lunulate sinus, the divisions being more or less divergent and acute. Each division is tipped with a hyaline papilla and bears a small and sharp tooth, also tipped with a papilla, on the outside. The underleaves are fairly definite in structure; each division is usually two or three cells wide at the base and three or four cells long, and the lateral tooth, which arises directly from the broad base, is usually composed of a single cell (*f. 8*). In the basal and apical regions of the stem the structure of the underleaves becomes somewhat simpler. The inflorescence in *C. Sullivantii* is dioicous but the sexual branches afford no differential characters of importance, and the perigynium and sporophyte are still unknown.

[1] Hep. Amaz. et And. 390. *pl. 16.* 1885.

The flattened stem with its distinct cortical layer, the bidentate leaves, the large leaf-cells with verruculose cuticle, and the minute underleaves with their sharp and unidentate divisions afford a combination of characters which will at once distinguish *C. Sullivantii* from all other known New England species. These peculiarities, however, are all shared by *C. arguta*, which, although European, has been reported from greenhouses in Philadelphia and is perhaps to be expected in similar localities elsewhere. *C. arguta* is distinguished mainly by the longer and more divergent teeth of its leaves, separated by a broader sinus.

9. **Calypogeia tenuis** (Aust.) spec. nov. *C. Trichomanis*, var. *tenuis* Aust. Hep. Bor.-Amer. *74*. 1873. *Kantia Trichomanis*, var. *tenuis* Underw.; A. Gray, Manual, Ed. 6, 713. 1890. In bogs. Closter, New Jersey (*C. F. Austin*). Woodbury, Connecticut (*A. W. E.*). The Woodbury specimens are in a somewhat better condition than those distributed by Austin and may be designated the type.

Pale to bright green, growing scattered among Sphagna or forming loose tufts: stems varying from prostrate to ascending or erect, 0.15–0.25 mm. in diameter, cylindrical and composed of undifferentiated cells; vegetative branches few, mostly postical but occasionally lateral: leaves distant to loosely imbricated, slightly convex, spreading at an angle of about 60 degrees, arching partially across the axis, ovate, 0.9–1.2 mm. long, 0.7–0.85 mm. wide, normally rounded and short-decurrent at base but often gradually long-decurrent in poorly developed forms, margin entire or irregularly sinuate, apex rounded, obtuse or more or less bilobed (in very rare cases even trilobed), both lobes and sinus very variable; leaf-cells thin-walled throughout, averaging 40 × 30 μ at the margin of the leaf and 50 × 40 μ in median and basal regions, cuticle smooth: underleaves distant, ovate or broadly ovate, 0.45–0.6 mm. long, 0.35–0.5 mm. wide, bifid to the middle or beyond with an obtuse sinus, divisions erect, triangular to subulate, acute to rounded at the apex, mostly six to nine cells long and four to six cells broad at the base, rarely bearing a blunt or sharp supplementary tooth on the outside: inflorescence (so far as known) dioicous: ♂ inflorescence occupying a short branch or terminal on a somewhat longer microphyllous branch; bracts in three to six pairs, closely imbricated, deeply two- to four-lobed; bracteoles small, deeply bifid; antheridia single or in pairs: ♀ inflorescence not seen: gemmae oval, mostly bicellular, with a slightly thickened outer wall, borne in dense masses at the tips of microphyllous stems or branches.

Although the present species is close to *C. Trichomanis*, agreeing with it in several important respects, it can be at once distinguished by its smaller size and more delicate habit, by its variable leaves

showing a strong tendency to be bidentate or bilobed, and by its deeply bifid ovate underleaves. Most of these peculiarities will also separate it from *C. fissa* Raddi, the type of the genus, which is perhaps to be expected in southern New England. This species also has more or less bidentate leaves and deeply bifid underleaves, but the teeth of the leaves are usually sharp, and the underleaves are considerably broader than long.

C. tenuis is of about the same size as *C. sphagnicola* and grows in similar localities. Its more widely spreading leaves and its larger leaf-cells, destitute of trigones, will at once serve to separate it. From *C. suecica* it may be distinguished by its loose habit and larger, thin walled cells. Although *C. tenuis* does not agree with any of the recent European segregations from *C. Trichomanis*, its detection in Europe would not be surprising.

10. Calypogeia Trichomanis (L.) Corda. The range of the present species extends across northern Asia, Europe and North America. Throughout this wide territory it is abundant nearly everywhere and has already been reported from each of the New England states. In its most typical condition it is found on soil rich in humus, either on shaded banks or in the woods. Under these circumstances the plants are more robust than in any of the preceding species, the leaves often attaining a length of 2 mm. and a width of 1.5 mm. Such leaves are imbricated and ovate, spreading from the stem at an angle of about 60 degrees; they are either rounded or very obtuse at the apex and at the base are straight and slightly or not at all decurrent. The underleaves are orbicular and close together but rarely imbricated; they attain a maximum length of about 1 mm. and are bifid one fourth or less with rounded divisions and a shallow, usually rounded, sinus. At the base they are more or less decurrent and are attached by an arched line; supplementary lobes on the sides are wanting or very infrequent. The leaf-cells average about $50 \times 40\ \mu$ but vary considerably both in form and in size. Their walls are thin throughout or very slightly thickened and do not show distinct trigones.

When the species grows on sandy soil or in very wet places some of the characters which have just been described show themselves to be unstable. The leaves, for example, tend to become long-decurrent and sometimes show indications of apical teeth, while the underleaves tend to become smaller, more deeply bifid and with sharper divisions.

It is often a question whether these aberrant plants actually represent forms of *C. Trichomanis*, or whether they may not be worthy of specific recognition. The tendency at the present time, as shown by the publication of such species as *C. sphagnicola*, *C. suecica* and *C. tenuis*, is to adopt the latter view, and it is probable that further segregations from *C. Trichomanis* will be made in the near future.

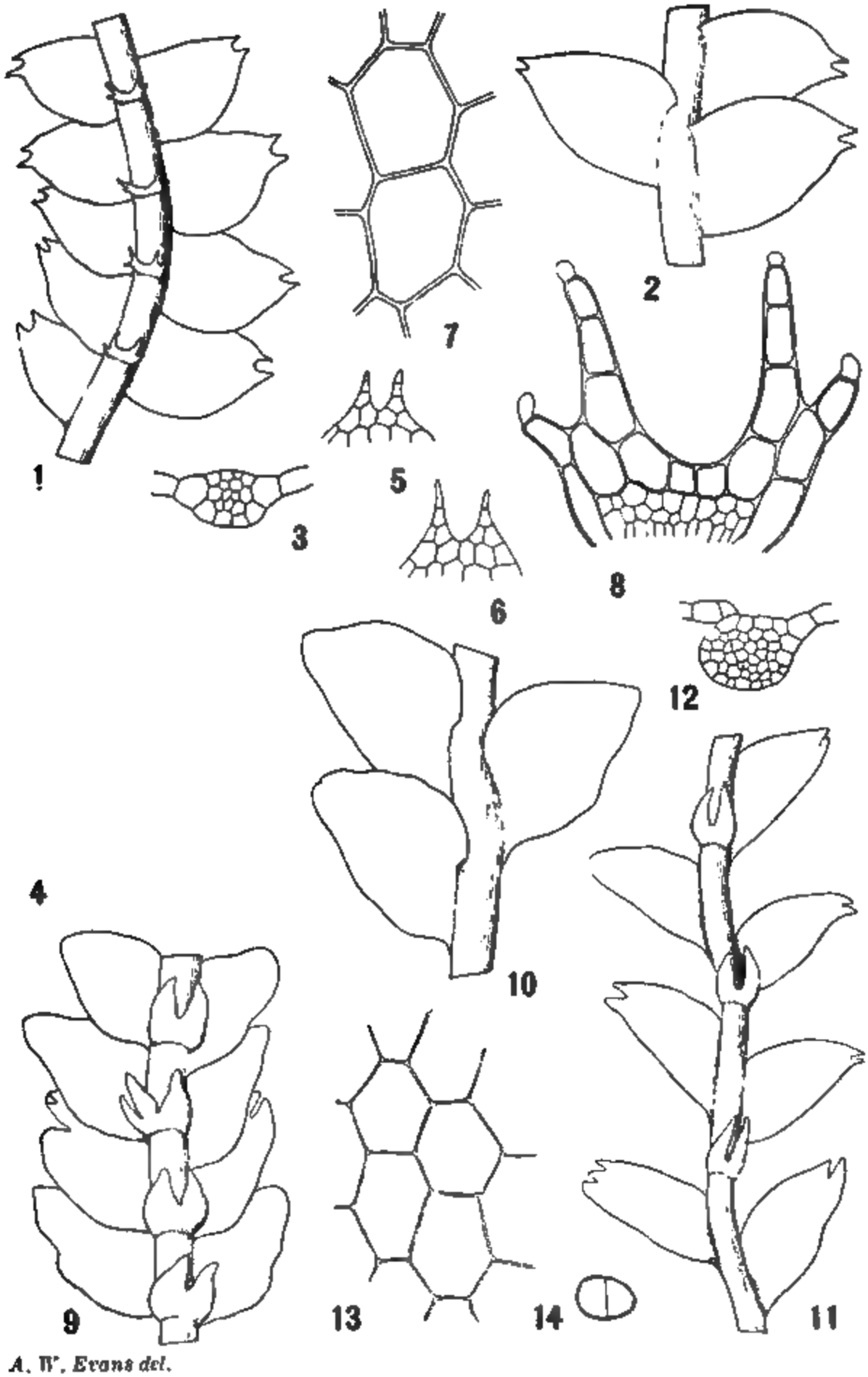
11. SCAPANIA APICULATA Spruce, Ann. & Mag. Nat. Hist. II. **4**: 106. 1849. *Martinellia apiculata* Lindb.; Lindberg & Arnell, Kongl. Svenska Vetensk.-Akad. Handl. **23**[5]: 32. 1889. On log in river; Chocorua, New Hampshire, August, 1906 (*W. G. Farlow*). This rare species was originally collected by Spruce on the French side of the Pyrenees, and for many years no other localities were reported. At the present time, according to Müller,[1] it is known from Norway, Germany, Switzerland and Siberia, as well as from France. He also quotes a single North American station, North Elba, New York, where Peck[2] collected the plant less than ten years ago. Chocorua is therefore the second locality recorded for North America. The species was found, however, by Macoun, as long ago as 1881, at Manitoba House, Manitoba, although it is not mentioned in his Catalogue of Canadian Plants. *S. apiculata* is one of the few species of the genus which grow on rotten logs. It bears a certain resemblance to small forms of *S. umbrosa*, which sometimes grows in similar localities. In *S. apiculata*, however, the leaves are entire, and their antical lobes spread obliquely instead of being suberect. Both lobes are either acute or apiculate. The leaf-cells average about 18 μ in the middle of the postical lobe and are characterized by distinct and often conspicuous trigones. The cuticle is said to vary from smooth to minutely verruculose, but the latter condition prevails in American specimens. The perianth is entire at the mouth or very slightly crenulate from projecting cells. The species frequently reproduces by means of gemmae, which present a characteristic appearance. They occur in dense masses at the tips of leaves which are somewhat reduced in size but otherwise scarcely modified. The gemmae themselves are oval in form and unicellular, and their walls are deeply pigmented with brown or purple. They resemble the bicellular gemmae found in *Sphenolobus exsectus*, but this species may be at once distinguished by the smaller and often tooth-like antical

[1] Nova Acta Acad. Caes. Leop. Carol. **83**: 265. 1905.
[2] Bull. N. Y. State Mus. **6**: 178. 1899.

lobes of its leaves, and by its smaller leaf-cells with indistinct trigones. Apparently the nearest ally of *S. apiculata* in North America is *S. glaucocephala* (Tayl.) Aust., which has been reported from New England without definite stations. In this species the gemmae are usually unicellular and are very similar to those just described. They are found, however, on modified flagelliform shoots bearing small and distant leaves. The normal leaf-cells are of about the same size as in *S. apiculata*, but their trigones are minute and scarcely evident. On the gemmiparous branches the cells which give rise to the gemmae are much larger than the others and show strongly thickened walls, but even here there are no distinct trigones. *S. apiculata* should be looked for in other parts of New England, especially in mountainous regions.

12. Frullania Tamarisci (L.) Dumort. The relationship between the present species and *F. Asagrayana* Mont. is so close that it is very difficult to draw a line of demarcation separating them. In the writer's Revision of the North American Species of *Frullania*,[1] certain characters derived from the basal auricles of the underleaves and from the lobules of the leaves and bracts are emphasized as differential. In *F. Tamarisci*, for example, the auricles of the underleaves and the large stylus of the lobule are described as crispate, while the lobules of the bracts are said to bear clusters of fine cilia at the base instead of distinct segments. In *F. Asagrayana*, on the other hand, the auricles (even when present) and the styluses are said to be never crispate, while the basal segments of the bracteal lobules are described as being well developed. In a recent letter Mr. S. M. Macvicar, of Invermoidart, Scotland, has called attention to the fact that these differential characters are by no means constant. In support of his statement he has kindly communicated specimens of a Scotch form of *F. Tamarisci* in which the underleaves and the lobules of the ordinary leaves are essentially like those in *F. Asagrayana*, and in which the lobules of the bracts bear distinct basal segments. That this form belongs to *F. Tamarisci* and not to *F. Asagrayana* is shown by the sharply pointed leaf-lobes and by the more or less irregular arrangement of their ocelli, the lobes in *F. Asagrayana* being normally rounded at the apex and developing ocelli in a nerve-like row. Apparently these slight and relative differences are all that remain to distinguish the two species, and it becomes a question whether to

[1] Trans. Conn. Acad. **10**: 27. 1897.



A. W. Evans del.

1–8 Calypogeia Sullivantii Aust.
9–14 Calypogeia tenuis (Aust.) Evans.

consider *F. Asagrayana* distinct or simply one of the extremes of a very variable species, the other being the robust normal form of *F. Tamarisci*. The first course seems to be still justifiable on account of the fact that no European forms of *F. Tamarisci* are known which exactly correspond with any of the American forms of *F. Asagrayana*. *F. Tamarisci* is a comparatively rare species in North America, and the following are the only New England stations known to the writer: Prospect Harbor, Maine (*Mrs. Northrop*); Blackstone, Rhode Island (*J. L. Bennett*); Seymour, Connecticut (*A. W. E.*). It has also been reported from Massachusetts.

The following represent additions to local state floras, not included in the preceding notes: *Frullania Brittoniae*, Buckfield, Maine (*J. A. Allen*); *Lophozia excisa*, North Haven, Connecticut (*A. W. E*)[1].; *L. porphyroleuca*, Willoughby, Vermont (*Miss Lorenz*) and Stafford, Connecticut (*G. E. Nichols*); *Odontoschisma denudatum*, Buckfield, Maine (*J. A. Allen*); *Sphenolobus minutus*, Mount Mansfield, Vermont (*Miss Lorenz*). The Maine record for *Riccardia palmata* and Rhode Island records for *Grimaldia fragrans*, *Reboulia hemisphaerica*, *Riccardia sinuata*, and *Geocalyx graveolens*, marked in the writer's Preliminary List with the sign "—" may now be marked with the sign "+", the necessary specimens of these five species having been collected and communicated by J. F. Collins.

The census of New England Hepaticae now stands as follows:— Total number of species recorded, 141; number recorded from Maine, 88; from New Hampshire, 105; from Vermont, 83; from Massachusetts, 81; from Rhode Island, 64; from Connecticut, 102; common to all six states, 37.

YALE UNIVERSITY.

EXPLANATION OF PLATE 73.

Calypogeia Sullivantii Aust. Fig. 1, part of stem, postical view, × 25; Fig. 2, part of stem, antical view, × 25; Fig. 3, cross section of stem, × 55; Fig. 4, surface view of stem, showing parts of four leaf-bases, × 55; Figs. 5, 6, apices of leaves, × 55; Fig. 7, cells from middle of leaf, × 200; Fig. 8, underleaf, × 200. The figures were all drawn from specimens collected by the writer at Atsion, New Jersey, and distributed in Hep. Amer. *156* (as *Kantia Sullivantii*).

Calypogeia tenuis (Aust.) Evans. Fig. 9, part of stem, postical view, × 25; Fig. 10, part of stem, antical view, × 25; Fig. 11, slender stem, postical view, × 25; Fig. 12, cross section of stem, × 55; Fig. 13, cells from middle of leaf, × 200; Fig. 14, gemma, × 265. The figures were all drawn from the type specimen.

[1] These specimens have already been recorded and figured by Miss Haynes in the Bryologist **9**: 99. *pl. 9, f. 10–13.* 1906.

New Stations for Chamaecyparis on Long Island, New York.— Professor Fernald of the Gray Herbarium has called my attention to the fact that in Jelliffe's Flora of Long Island the only authority given for the occurrence of *Chamaecyparis thyoides* (L.) B. S. P., on the island is a report made in 1874 by E. S. Miller and H. W. Young who listed it as growing in Suffolk Co. In view of this it seems worth recording that there is a good colony of the tree growing within sight of the Long Island Railroad between the stations of Merrick and Bellmore, Nassau Co., and another just west of Amityville.— John Treadwell Nichols, American Museum of Natural History, New York.

An Occurrence of Catharinaea crispa in Maine.— I am pleased to announce the discovery of *Catharinaea crispa*, James in Maine, as I understand it has never before been reported from this state, or so far northeasterly as this. It was fertile, and was found in Camden, Maine, 44° N. lat. 69° W. long., in a pasture near the bank of a large brook, on knolls where six years ago a growth of alders had been cleared away. The altitude is about 200 feet. For its determination I am indebted to Mr. E. B. Chamberlain. Prof. J. Franklin Collins, in his list of New England plants, Rhodora **8**: 131, gives only Massachusetts as definitely possessing it.— Alice L. Crockett, Camden, Maine.

Noteworthy Plants of Salisbury, Connecticut.— The past season I have been able to add the following rare or unusual plants to the list of those growing about Salisbury, Connecticut.

Aspidium simulatum Davenp. In a black spruce swamp growing in sphagnum. Elevation 2000 ft. Quite abundant.

Pellaea gracilis Michx. A third colony of this rare fern on an exposed boulder in a dense pine wood.

Lycopodium annotinum L. In the same swamp with the *Aspidium simulatum*

Potamogeton lucens Connecticutensis Robbins. Seems to be fairly abundant in one of the Twin Lakes.

Eleocharis olivacea Torr. One colony on the shore of a mountain lake at an elevation of 2000 ft.

Habenaria orbiculata (Pursh) Torr. In rich woods at Lime Rock. Not at all common.

Claytonia Virginica L. A number of large colonies in a hardwood swamp.

Polanisia trachysperma T. & G. A waif from the west but growing abundantly on the gravelly banks of the Salmonkill at Lime Rock.

Lythrum alatum Pursh. A large colony on a dry hillside not far from Twin Lakes.

Vaccinium Canadense Richards. Found by Mr. Weatherby of East Hartford in one of the mountain swamps.

Polemonium Van Bruntiae Britton. Three vigorous plants in a swamp bordering a lake. Seems to be native.

Hydrophyllum Virginicum L. In thicket along set-backs from the Housatonic river.

Scutellaria parvula Michx. Wet meadow near Twin Lakes.— ORRA PARKER PHELPS, Chapinville, Connecticut.

ARCEUTHOBIUM PUSILLUM AT MT. DESERT.— Since the discovery of the Dwarf Mistletoe in abundance on Isle au Haut in East Penobscot Bay I have seen no reason why it should not occur on Mt. Desert as well, and have, therefore, from time to time made careful search for it in the endeavor to extend its range eastward along the coast. I met with no success in my examination of its most common host-plant, the Swamp Spruce (*Picea nigra* Link). Witches' brooms, to be sure, were often met with, but all appeared due to some other cause. I, therefore, began to think that the Island was free from this destructive but interesting plant. In August, 1906, however, just back of the precipitous cliff of Great Head on Frenchmans Bay a thriving colony of Arceuthobium was found at last. At the time it was unfortunately impossible to make careful observations of the extent of this colony, but judging from the general appearance of the spruces it had been long established. The host-plant here proved, in every case observed, to be the White Spruce (*Picea alba* Link), the most characteristic spruce of the rocky shores of the region.

The facts observed in regard to the dwarf mistletoe and this host were practically the same as those mentioned by Dr. von Schrenk as occurring under the same conditions on Monhegan Island and the neighboring mainland, published in RHODORA (ii. 2, 1900), so any repetition is unnecessary. One observation, however, made from these Mt. Desert specimens I speak of here because, so far as I know,

there is no prior record of it. The influence of the parasite on its host is well marked in various ways, as noted in the article above referred to, and is of a decidedly stimulating character as is shown by greatly increased growth of branchlets and leaves. In my specimens a further effect was shown by a decided change in the odor of the spruce leaves where this stimulated growth took place, or in other words where the mistletoe was found. When I first noticed a sweetish balsamic odor, far more resembling that of the Fir Balsam than that of the White Spruce, I felt that I had mistaken the identity of the host-plant. I found, however, that I had made no mistake, but that these White Spruce leaves no longer retained in any marked degree the disagreeable odor which has given the species the name of Cat, or Skunk Spruce. This modification of odor thus produced in the host by the parasite is very agreeable, and so marked as to be decidedly noticeable. This fact I verified by submitting specimens to a number of persons, all of whom reached this same conclusion. Some of them could not be convinced that the leaves from the infected and the uninfected trees were not those of different species. It may be added that some species of Arceuthobium have a decidedly balsamic odor, but this was not noticed in my specimens of *A. pusillum*.— Edward L. Rand, Boston.

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THE BASIS OF NOMENCLATURE FOR ALGAE.

F. S. Collins.

Readers of the article "On the Vienna Rules of Botanical Nomenclature" in the March Rhodora will remember that Art. 9 reads "The rules and recommendations of botanical nomenclature apply to all classes of the plant kingdom, reserving special arrangements for fossil plants and non-vascular plants"; and that a footnote states that these special arrangements have been reserved for the Congress of 1910. The questions involved in regard to cryptogams are many and difficult to answer, and when we consider the long and careful work that was necessary to reach a conclusion in regard to the vascular plants, the time before the next Congress is none too long for their consideration. "Botanical nomenclature begins with the Species Plantarum of Linnaeus," says Art. 19; but if one considers the quite insignificant space given to the cellular cryptogams in this work, it might possibly be called a "point" for starting, certainly not a "base" for anything. The writer cannot claim any familiarity with the subject except as regards the algae, but would like to call attention to some features of their case.

While the number of known species of flowering plants has increased almost in geometrical ratio, the idea of a species, on the whole, remains about the same. Some species have been found to be aggregates; with rapidly increasing numbers of species more attention has to be given to smaller details, but in the great majority of cases the characters by which species are differentiated can be seen by the naked eye, or with a pocket lens. As regards algae, not one species in a hundred can be described so that it could be recognized without the use of the microscope, usually requiring quite high powers. Of course none of these

could have been recognized in Linnaeus's day, nor for a long time afterwards. The system of classification adopted by Linnaeus for flowering plants remained in general use until superseded by a natural system, which in its general outlines and often in considerable detail is accepted at present. But all through the nineteenth century system after system was proposed for the algae, each practically beginning anew, the position of genera changing with kaleidoscopic rapidity. It is sometimes really pathetic to see with what conscientious care a system was developed on what we now know to have been scanty material, imperfect data, and misinterpreted observations. Occasionally we find a piece of work in some limited field of which the records have been supplemented rather than superseded by later observations; thus the insight of Vaucher's Histoire des Conferves, that celebrated its centenary four years ago, is little short of marvellous, when we consider the scanty appliances then available; Nägeli's Gattungen einzelliger Algen of 1848 must be referred to to-day by everyone studying the unicellular algae; but Nägeli's system, like the systems of Kützing and the others, was hardly more permanent than last year's snows. Back of the time of C. Agardh, in the earlier part of the last century, practically no types are to be found; and though in the Agardh herbarium, continued by the son, J. G. Agardh, we have a most valuable collection of original specimens, we find in many cases that more than one species, as we now know them, was included under one name; it was impossible to distinguish them at that day, and of course the diagnosis, giving only the characters then discernible, gives us little help as to which species should bear the name. Evidently the basis that is suitable for the nomenclature of the *Rosaceae* is not suitable for the nomenclature of the *Chlorophyceae*.

But is it possible to fix any one satisfactory basis for algae in general? The more we look at it, the less likely it seems. The larger algae, those included in the genus *Fucus*, were fairly well known to the older authors, so that nearly all of the species in Turner's Icones Fucorum, 1808–1819, remain valid to-day; but this is by no means the case with the species of Dillwyn's British Confervae of 1809. To ignore Turner's species in the Icones would certainly be unwise; to identify species of *Microspora* or *Oedogonium* by Dillwyn would be very difficult. Though the idea of different starting points for different families of algae may seem at first undesirable, it may be the best solution of the problem; a definite proposition to that

effect, the first proposition of the kind as far as known to the writer, has been made by Prof. O. Nordstedt.[1] As Nordstedt is the highest authority on the desmids, was a member of the Congress of Vienna, and was appointed on the committee to take charge of the preliminary work on non-vascular plants for the Congress of 1910, his opinions should carry much weight. He considers in detail all the genera and many of the species of desmids, proposed in the first half of the last century, a chaotic assemblage. While some authors made contributions of merit, there is no one work that can be considered as at all complete to its time until we come to Ralfs, who in 1848 published The British Desmidieae; this work gives detailed descriptions and excellent figures of all the British forms, and has as an "Appendix," a list of all other known species, a large part of them also with figures and descriptions. With few exceptions all the literature of the desmids up to 1848 was gone over by Ralfs, and references noted; the few papers to which Ralfs does not refer have been analyzed by Nordstedt, and while they add a few synonyms to Ralfs's species very little other change would have been necessary had Ralfs used them. There are a few genera in Ralfs's work which might have to give place to older names if we could be certain where we are now doubtful, but as after careful study of the older authors the uncertainty remains and is likely to continue, Nordstedt considers that the wisest plan will be to adopt for the desmids the rule "The nomenclature begins with the British Desmidieae by Ralfs in 1848." As a second rule he provides that all names used by Ralfs in Brit. Desm. as of earlier authors, should be so quoted, but only as so attributed by Ralfs; for instance *Euastrum oblongum* Grev. sec. Ralfs, Brit. Desm.

That this plan will simplify the nomenclature of the desmids is unquestionable, and that it will cause any serious inconvenience is unlikely. That Ralfs's monograph contains a few genera no longer classed as desmids can occasion no trouble, nor the fact that some of his genera have since been divided; that is merely what has always happened with increasing knowledge and discoveries of new forms. While in some cases Ralfs may have been misled by a faulty or hazy description by some older author, the chance of our now correcting this error is too small to outweigh the real gain of accepting Ralfs's definite description and clear figure, and working from them.

[1] Algological Notes 1–4. 1. The starting point of the nomenclature of Desmids. Botaniska Notiser, 1906, p. 97.

At the close of his paper Nordstedt mentions three monographs which may be used for bases in their respective sections; for practical work all three are now the standards, but to those who are worshipers of priority in itself, rather than as far as it may be the most useful means to an end, it will be rather a shock to find that these monographs date from 1888, 1893 and 1900 respectively: Gomont, Monographie des Oscillariées, 1893, and Bornet et Flahault, Revision des Nostocacées hétérocystées contenues dans les principaux herbiers de France, 1886–1888, have brought order where disorder reigned before; but as Nordstedt himself notes, they seldom recognize any species of which the authors have not examined authentic specimens; following each genus is a list of species inquirendae. Hirn, Monographie und Iconographie der Oedogoniaceen, 1900, is a more complete work, covering practically all known species, with full illustrations. It should be added that in the case of the heterocysted nostocs, Bornet and Flahault have since 1888, as a consequence of the examination of original specimens before unseen, published a paper changing in some few instances the names used in the Revision. What the status of these later names would be in case of the Revision being accepted as the beginning of nomenclature might be an interesting question.

In conclusion; the fact that Nordstedt recommends Ralfs as the starting point for the nomenclature of desmids is in itself a strong argument in favor of the plan, and a careful reading of his paper will prove quite convincing, it would seem, to any one who had not in some way prejudged the matter. It is likely that in regard to the other groups Nordstedt's suggestions, which are put forward as propositions only and without evidence or argument, may meet with more opposition; if so, however, it is for their opponents to propose something better.

MALDEN, MASSACHUSETTS.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT,— I.

OVER a year ago the New England Botanical Club decided to collect information in regard to the plants growing within 25 miles of Boston. This district was afterward extended, so that it runs northward to the New Hampshire line; west to include Dunstable, Groton, and Ayer; then southward along the Worcester county line, including Southboro, to Bellingham, on the Rhode Island boundary; thence eastward to the coast at Duxbury. The district thus formed is a good geographical unit, bounded by the New Hampshire line, the hill country of central Massachusetts, and the level sand-plain and morainal territory of southern Bristol and Plymouth counties. It therefore seems that it should possess a definite flora of its own, distinct in many ways from regions to the north, west and south.

The committee in charge has gathered a large amount of data in regard to the ferns of this district, which has been condensed into the present form for publication. This list is still regarded as a preliminary one, and any additions or corrections will be welcomed. There is especial lack of information in regard to the outlying towns of the region, in the south and west portions.

Card-records have been received regarding the ferns of this district from the Gray Herbarium, the Ames Botanical Laboratory, and the herbaria of Tufts College, the New England Botanical Club, the Boston Society of Natural History, the Appalachian Club, and the Bridgewater State Normal School. The following individual collectors have also furnished cards recording the ferns in their collections: Dr. C. A. Cheever, Hon. J. R. Churchill, J. A. Cushman, Walter Deane, Raynal Dodge, A. A. Eaton, F. G. Floyd, T. O. Fuller, C. H. Knowlton, A. H. Moore, C. H. Morss, A. S. Pease, George O. Tilton, R. A. Ware and E. F. Williams.

Wherever unusual ferns have been reported, the specimens themselves have been examined. Special examination has been made of the ferns in the Gray Herbarium, the Davenport collection of the Massachusetts Horticultural Society, and the herbaria of the New England Botanical Club and the Ames Botanical Laboratory. The Committee wishes to express its indebtedness to Dr. B. L. Robinson of the Gray Herbarium for advice and assistance in preparing this report.

POLYPODIACEAE.

POLYPODIUM.

P. vulgare L. Dry rocks and ledges, common.

PHEGOPTERIS.

P. polypodioides (L.) Fée. Damp rich woods; occasional, especially northward.

P. hexagonoptera (Michx.) Fée. Rich open woods, not common. All reports are from the central part of our territory.

P. Dryopteris (L.) Fée. Rich especially coniferous woods; occasional in Essex County, but rare elsewhere; not reported south of Needham.

ADIANTUM.

A. pedatum L. Rich deciduous woods; generally distributed, but only locally abundant.

PTERIS.

P. aquilina L. Dry open woods and uplands, common.

WOODWARDIA.

W. virginica (L.) Sm. Wet woods and peat-bogs, sometimes in water; frequent.

W. areolata (L.) Moore. (*W. angustifolia* Sm.) Swamps and wet woods; frequent within ten miles of tide-water, the stations often extensive.

ASPLENIUM.

A. Trichomanes L. Dry ledges; frequent, but never abundant in our range.

A. platyneuron (L.) Oakes. (*A. ebeneum* Ait.) Rocky soil and ledges throughout.

Var. **serratum** (E. S. Miller) BSP. One specimen, collected in Malden by Mr. George E. Davenport in 1872 and identified by Dr. Asa Gray, is now in the Gray Herbarium; and another, from Melrose, is in the Davenport Collection.

A. acrostichoides Sw. (*A. thelypteroides* Michx.) Rich woods; occasional in the northern towns, less frequent southward.

A. Filix-femina (L.) Bernh. Usually in damp woods and shaded places, though occasionally in drier situations; common and varying much with the conditions of soil, moisture, and shade. Var. **angustum** (Willd.) D. C. Eaton. Woods, occasional.

CAMPTOSORUS.

C. rhizophyllus (L.) Link. Granite ledges, Needham, where observed as early as 1877; formerly also on Doublet Hill, Weston.

POLYSTICHUM.

P. acrostichoides (Michx.) Schott. (*Aspidium acrostichoides* Sw.) Rocky woods, distributed here and there, but not very common. Var. **Schweinitzii** (Beck) Small. (Var. *incisum* Gray.) Amesbury (*J. W. Huntington*); Andover (*A. S. Pease*); Blue Hills (*E. F. Williams*).

ASPIDIUM.

A. Thelypteris (L.) Sw. Swamps, common everywhere.

Forma **Pufferae** (A. A. Eaton) B. L. Robinson in herb. *Nephrodium Thelypteris*, forma *Pufferae* A. A. Eaton. Border of meadows, Sudbury (*Mrs. J. J. Puffer*). See Eaton, Fern Bull. x, 78.

A. simulatum Davenp. Swampy woods; locally abundant; often associated with the preceding and with *Woodwardia areolata*. See Davenp. Bot. Gaz. xix. 494, 495.

A. noveboracense (L.) Sw. Low open woods, common.

A. marginale (L.) Sw. Rocky woods, common throughout. Var. ELEGANS J. Robinson (Bull. Essex Inst. vii. 51) is a luxuriant form with the pinnules more deeply crenate-toothed. This form not very sharply distinguishable from the type has been found at Ipswich (*Oakes*), Swampscott (*J. Robinson*), and Milton (*F. G. Floyd*).

A. Boottii Tuckerm. Low woods, frequent.

A. cristatum (L.) Sw. Open and wooded swamps; frequent: reported as abundant in Brockton, Easton, and in northern Essex County.

Var. **Clintonianum** D. C. Eaton. Wooded swamps, occasional; not reported from open land. Not so extreme as the more northern and western specimens.

A. cristatum × **marginale** Davenp. Where swamps meet the rocky woods, rare. First described by Mr. Davenport from northern Essex County; Boxford, Merrimac, Salisbury, Medford, Byfield, Brockton; see Davenp. Bot. Gaz. xix. 494, 495.

A. spinulosum (O. F. Müller) Sw. Low open woods, frequent.

Var. **intermedium** (Muhl.) D. C. Eaton. Rich woods, frequent.

Var. **dilatatum** (Hoffm.) Hook. Swampy woods, fairly plentiful at Brockton (A. A. Eaton).

Forma **anadenium** B. L. Robinson.[1] This form, characterized by a glandless or essentially glandless indusium, includes the greater part of what has heretofore passed as var. *dilatatum* in America. It may be distinguished from the typical *A. spinulosum* by the narrower firmer and darker brown scales of the stipes and from var. *intermedium* by its broader ovate fronds and glandless indusium. In our region it is relatively rare and never quite so characteristic as in mountain specimens. Reports indicate that it has been found in Chelsea, Dedham, Manchester, and Woburn.

Var. **concordianum** (Davenp.) Eastman. Rich swampy woodland, Concord (*Purdie & Brewster, Davenport & Purdie*). See Rhodora, vi. 31–33.

CYSTOPTERIS.

C. fragilis (L.) Bernh. Moist or wet rocks and ledges in shade; not common, especially southward.

[1] Concerning this form Dr. Robinson makes the following statement: "*Aspidium spinulosum*, var. *dilatatum* (Hoffm.) Hook., as it occurs in Europe, regularly exhibits a glandular indusium, a fact substantiated by specimens and by the statements of several critical and reliable authors, such as Moore, Milde, Christ, and others. This European form must be regarded as the typical state of the variety. Until recently it has been almost unknown in America. To it seems to belong, however, the plant not long since described as *Nephrodium spinulosum*, var. *fructuosum* Gilbert, and study of a considerable suite of American specimens referred to Var. *dilatatum* shows that the indusium is occasionally glanduliferous as in the European plant. Nevertheless, as Prof. D. C. Eaton long ago remarked the indusium in the American Var. *dilatatum* is habitually glandless. This glandless form, which is readily recognizable with a good lens, seems never to have had a distinctive name and may therefore be called A. SPINULOSUM, VAR. DILATATUM, forma **anadenium**, n. f. indusio glandulis fere vel omnino destituto.— As an appropriate type-specimen for this new form I would mention a plant collected in deciduous woods, alt. 760 m., 14 August, 1895, on Barren Mt., Elliottsville Piscataquis County, Maine, by M. L. Fernald, no. 426 (type in hb. Gray; cotypes in several public and private herbaria). Forma *anadenium* is widely distributed in Atlantic North America, chiefly in mountainous regions."

WOODSIA.

W. ilvensis (L.) R. Br. Exposed dry ledges, occasional.
W. obtusa (Spreng.) Torr. Shaded ledges; scattered stations throughout.

DICKSONIA.

D. punctilobula (Michx.) Gray. (*D. pilosiuscula* Willd.) Moist soil in open places and light shade; common.

ONOCLEA.

O. sensibilis L. Damp woods and meadows, abundant.
O. Struthiopteris (L.) Hoffm. Moist soil, usually in shade; rare; not reported south of Boston.

LYGODIUM.

L. palmatum (Bernh.) Sw. Low thickets, rare. Carlisle, Concord, Dover (1883, 1884), Saugus (1885), Newton; the last three stations probably extinct.

OSMUNDA.

O. regalis L. Swamps, wet woods, and lake shores; common.
O. Claytoniana L. Somewhat less common than the following species.
O. cinnamomea L. Swamps and low woods, common. The formal var. FRONDOSA Gray is occasionally found with the typical form.

OPHIOGLOSSACEAE.

OPHIOGLOSSUM.

O. vulgatum L. Moist fields and pastures, local.

BOTRYCHIUM.

B. simplex E. Hitchcock. Low woods; Amesbury, Byfield, Easton, Salisbury, W. Newbury.
B. lanceolatum (Gmel.) Angstr., var. **angustisegmentum** Pease & Moore. Low woods, rare; stations occasionally large. See Rhodora, viii. 229.
B. ramosum (Roth) Aschers. (*B. matricariaefolium* A. Br.) Low woods; Amesbury, Dedham, Natick, Needham, Salisbury, W. Newbury.

B. obliquum Muhl. Old fields and pastures; occasional, and locally abundant.

Var. **elongatum** Gilbert & Haberer. Georgetown (*Mrs. C. S. N. Horner*, specimen in hb. N. E. Bot. Club, also in the Davenport Collection).

Var. **dissectum** (Spreng.) Clute. Old fields and pastures, frequent.

B. ternatum (Thunb.) Sw., var. **intermedium** D. C. Eaton. Old fields, pastures, and rarely in woods; frequent.

B. virginianum (L.) Sw. Rich woods, occasional.

A. K. Harrison, (Chairman)
F. F. Forbes,
C. H. Knowlton,
R. A. Ware.
} *Committee on local flora*

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,—XX.

SPARGANIACEAE.[1]

M. L. Fernald and A. J. Eames.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Sparganium americanum Nutt.	+	—	+	+	+	+
" " var. androcladum (Engelm.) Fernald & Eames	+	+	+	+	+	+
" angustifolium Michx.	+	+	+	+		+
" diversifolium Graebner	+	+	+	+		+
" " var. acaule (Beeby) Fernald & Eames	+	+	+			+
" eurycarpum Engelm.	+	—	+	+	+	+
" fluctuans (Morong) Robinson	+	+	+	+		+
" lucidum Fernald & Eames				+		
" minimum Fries	+		+	+		+
" simplex Hudson	+		+			

[1] Printed in Rhodora as supplementary material.

Notes upon the above List.

Sparganium fluctuans (Morong) Robinson. For detailed discussion see Rhodora, vii. 60 (1905).

Sparganium simplex Hudson has been reported from all the New England states, but it is very doubtful if it occurs as far south as Massachusetts. Most of the plants of southern New England so reported have proved to be either *S. americanum*, *S. diversifolium* or its var. *acaule*, or *S. lucidum*. The New England plants which have been passing as *S. simplex* may be distinguished as follows.

Sparganium simplex and its New England Allies.

* Pistillate heads or branches of the inflorescence strictly axillary.

+– Mature fruits dull: stigma 1–2 mm. long.

S. americanum Nutt. Stoutish, 3–7 dm. high: leaves deep green, dorsally carinate, 6–12 mm. broad: bracts divaricate or arcuate-ascending, the lowest 0.8–2.2 dm. long: inflorescence simple: pistillate heads 2 to 5, all axillary, sessile or nearly so, in fruit 1.8–2.6 cm. in diameter: tepals with dilated and rounded erose summits; their bases closely investing the stipe of the carpel: mature fruits brownish, fusiform; the narrowly ellipsoid or subcylindric body 5–6 mm. long, 2–3 mm. thick; the beak (including the stigma) 2.5–4 mm. long, about equalling the slender stipe.— Gen. ii. 203 (1818). *S. simplex*, var. *Nuttallii* Engelm. in Gray, Man., ed. 5, 481 (1867); Morong, Bull. Torr. Cl. xv. 79 (1888). *S. simplex* of many Am. auth., not Hudson. *S. angustifolium* Graebner in Engler., Pflanzenr. iv. no. 10, 16, in part (1900), not Michx. *S. Nuttallii* Engelm. according to Graebner, l. c. (1900). *S. americanum*, var. *Nuttallii* Graebner, l. c. (1900). *S. simplex*, var. *americanum* Farwell, Ann. Rep. Mich. Acad. Sci., vi. 202 (1904).— Bogs and muddy shores, New Brunswick to Iowa and Virginia; also in eastern Asia.

Var. **androcladum** (Engelm.), n. comb. Inflorescence bearing from its lower axils 1 to 3 weak branches: leaves often broader (rarely 2 cm. broad): lowest bract 1.5–5 dm. long.— *S. simplex*, var. *androcladum* Engelm. in Gray, Man., ed. 5, 481 (1867). *S. ramosum* Chapm. Fl. 443 (1860), not Huds. *S. androcladum* Morong, Bull. Torr. Cl. xv. 78 (1888); Graebner in Engler, Pflanzenr, iv. no. 10, 15 (1900).— Similar places, more common, Newfoundland to Minnesota, south to Florida and Missouri.

+– +– Mature fruits lustrous: stigma 2.5–4 mm. long.

S. lucidum, n. sp. Planta 7.5–9 dm. alta; foliis 5–12 mm. latis, erectis, firmis et haud pellucidis, valde carinatis, inflorescentiam sim-

plicem vel ramosam multo supereminentibus, capitibus vel ramis plane axillaribus; bracteis patente ascendentibus, infima 2.5–4 dm. longa; capitibus femineis sessilibus vel infimis pedunculatis, ad maturitatem circiter 3 cm. diametro; tepalis ad stipitem affixis, ligulatis, apice dilatatis et rotundis, subintegris vel erosis; costa media prominente et in apice suo incrassata; fructubus maturis lucidis, olivaceo-brunneis, breviter stipitatis, corpore subterete, 5–6 mm. longo, 2–3 mm. crasso; stylo subulato-filiforme, 5–7 mm. longo, parte lineare stigmatica adunca, 2.5–4 mm. longa.

Plant 7.5–9 dm. high: leaves 5–12 mm. broad, erect, firm and opaque, strongly carinate, much overtopping the simple or forking inflorescence: the heads or branches strictly axillary: bracts spreading-ascending, the lowest 2.5–4 dm. long: pistillate heads sessile, or the lowest peduncled, in fruit about 3 cm. in diameter: tepals attached to the stipe, ligulate, with dilated and rounded sub-entire or erose tips; the midrib prominent and thickened at its apex: mature fruits lustrous, olive-brown, short-stipitate; the subterete body 5–6 mm. long, 2–3 mm. thick: style subulate-filiform, 5–7 mm. long; the linear stigmatic portion hooked, 2.5–4 mm. long. — Massachusetts, small pond, Medford, July 29, 1860 (*Wm. Boott*); muddy shore of Half-way Pond, Barnstable, August 23, 1888 (*W. Deane*): Pennsylvania, ditches, Philadelphia, September, 1876 (*I. C. Martindale*): Illinois, without station (*S. B. Mead*): Missouri, Springfield, September 1, 1893 (*J. W. Blankinship* in hb. Deane).

*** * One or more of the pistillate heads supra-axillary.**

+— Erect plants of shores and swamps: leaf-blades of uniform texture, somewhat translucent and reticulated under a lens.

S. diversifolium Graebner. Erect, stoutish, 3–6 dm. high: leaves delicate, cellular-reticulated on both sides, 4–9 mm. wide, with a broad scarious margin toward the base: bracts strongly ascending, the lowest 2–5 dm. long: inflorescence mostly simple, rarely with 1 or 2 weak branches: pistillate heads 2 to 4, chiefly sessile, the lower remote and supra-axillary, in fruit 2–2.5 cm. in diameter.— Graebner in Schrift. naturf. Ges. Danzig, N. F., ix. (1895) 335, t. 8, fig. 1, and in Engler, Pflanzenr, iv. no. 10, 21, fig. 4 F. (1900). *S. simplex* in great part of Am. auth., not Hudson.— Eastern Quebec to South Dakota, Connecticut and Illinois and probably southward; also in Europe. Passing to

Var. **acaule** (Beeby), n. comb. Dwarf, 1–3 dm. high: leaves and bracts comparatively narrow; the lowest strongly ascending bract 1–3 dm. long: pistillate heads 1.5–2 cm. in diameter, usually crowded. — *S. simplex*, var. *acaule* Beeby in Macoun, Cat. Can. Pl. ii. 367 (1890). *S. diversifolium*, proles *nanum* Graebner in Engler, Pflanzenr. iv. no. 10, 21 (1900). *S. nanum* Fries according to Graebner, l. c. (1900).— Newfoundland to Iowa and West Virginia.

+— +— Strictly aquatic: leaf-blades reticulated beneath, opaque above.

++ Fruits rather abruptly slender-beaked: leaf-blades 1.5–4 mm. broad: stigma rarely over 1.2 mm. long.

S. ANGUSTIFOLIUM Michx. Slender aquatic: stems 3–12 dm. long: leaves exceedingly long and narrow, opaque: bracts comparatively short, slightly dilated at base, the lowest 0.5–3 dm. long: inflorescence simple, at the surface of the water: pistillate heads 1 to 3, sessile or peduncled (the lowest peduncle rarely 9 cm. long), in fruit 1.3–2 cm. in diameter: fruits 1.5–2 mm. thick, drab, with reddish-brown bases.— Fl. ii. 189 (1803); Graebner in Engler, Pflanzenr. iv. no. 10, 16, in part (1900). *S. simplex*, var. *angustifolium* Engelm. in Gray, Man., ed. 5, 481, (1867). *S. affine* Macoun, Cat. Can. Pl. ii. 71 (1888), perhaps also of Schnitzlein, Nat. Pfl. Typh. 27 (1845).— Ponds and slow streams, Newfoundland to Alaska, south, especially among the mountains, to Connecticut, New York, Colorado and California; ascending in alpine ponds to an altitude of 1140 m. on Table-top Mountain, Gaspé, and to 3500 m. in Colorado. Perhaps also in Eurasia (*S. affine* Schnitzlein).

++ ++ Fruits gradually acuminate: leaf-blades 4–9 mm. broad: stigma 1.5–2 mm. long.

S. SIMPLEX Hudson. Coarser, and in our region strictly aquatic: stems 3–10 dm. long: bracts somewhat dilated at base, the lowest 1–4 dm. long: inflorescence usually simple, elongated: pistillate heads 2 to 4, mostly supra-axillary, the lowermost long-peduncled, in fruit 2–2.5 cm. in diameter: fruit 1.5–2.5 mm. thick.— Fl. Angl. ed. 2, 401 (1778); Am. auth. in small part only; Graebner in Engler, Pflanzenr. iv. no. 10, 16 (1900).— Newfoundland to British Columbia, south to Maine, northern Vermont, Lake Superior region, Colorado, Utah, and California; also Eurasia.

Var. MULTIPEDUNCULATUM Morong. Heads aggregated, mostly pedunculate, subcorymbose.— Bull. Torr. Cl. xv. 79 (1888); Graebner in Engler, Pflanzenr. iv. no. 10, 17 (1900). *S. multipedunculatum* Rydberg, Bull. Torr. Cl. xxxii. 598 (1905).— From the Mackenzie River to Colorado and California; to be expected in northern New England and adjacent Canada.

SUGGESTIONS FOR SPECIAL OBSERVATIONS.

Sparganium angustifolium Michx. should be sought in the ponds and lakes of northwestern Rhode Island.

S. diversifolium Graebner may be sought in northwestern Rhode Island, and its var. *acaule* should be looked for there and in central and western Massachusetts.

S. fluctuans (Morong) Robinson may be expected in the larger ponds and lakes of northwestern Rhode Island.

S. lucidum Fernald & Eames, as yet known only from eastern Massachusetts, Pennsylvania, Illinois and Missouri, is probably in Rhode Island and Connecticut.

S. minimum Fries may be confidently sought in clear cold streams of northern New Hampshire.

S. simplex Huds. is apparently rare in northern and central Maine and northern Vermont, but it should be sought in all the larger lakes of northern New England.

Gray Herbarium.

CAUSES OF VARIATION IN COLOR IN SOME RED ALGAE.

William A. Terry.

For many years past I have noticed a marked difference in color in specimens of red algae from different localities; this is specially noticeable in *Dasya elegans* (Mart.) Ag.; plants from South Beach, a mile or more east of the entrance to New Haven harbor, always drying a sepia brown, while those from below Woodmont, some miles west, dry a dark purple, and those from Fort Hale, inside the harbor, show a bright crimson pink color. These differences are constant, and have shown themselves so for many years. My specimens are taken, when possible, directly from the rocks on which they grow; they are generally procured by wading at lowest tide, but sometimes from a boat by means of a sharp-edged scraper with a long handle. Such specimens are much deeper in color than those from shallow water. When broken from their holdfasts they change rapidly in color, in a few hours showing a decided tinge of brown. All these fine red seaweeds, if mounted in salt water, lose their characteristic color from the concentration of the salt, and become more or less black. To obviate this as much as possible, I lay out and cleanse the plant in a dish of salt water, then transfer on the cardboard to a mounting board in fresh water, rapidly place and lift out of the water, drain slightly and place in driers which are changed frequently until dry. In this

way much of the original color remains in some species; others obstinately persist in turning black when drying. The different behavior of plants apparently quite similar led me to make some experiments last November, which gave me new light on the question. I found most beautiful plants of the delicate Callithamnion of a most brilliant rosy color growing in deep water on the reef at Woodmont, and was much disappointed to find them losing their color in drying. I had used sometimes the city water and sometimes water from the shallow wells of the region in mounting, and I found a slight difference in favor of the city water; I then experimented with rain water, with marked success. It was evident that the mineral dissolved in the ordinary water was sufficient to destroy the color in drying.

The rocks on which the seaweeds grow at South Beach are red granite. The beach contains a large amount of red sand, sufficiently heavy to be easily separated from the quartz sand by washing. A superficial examination seems to show zircon and garnet, and a mineralogist to whom I sent a sample said that it contained about two per cent of monazite. The rocks on which the red Dasya grows at Fort Hale are trap. The purple Dasya at Woodmont grows on a curious shale or slate, that suggests the vicinity of magnesian limestone. It is penetrated by fresh water springs from the mainland, the water containing iron and lime.

THE SCIENTIFIC NAME OF THE OSAGE ORANGE.—The Osage Orange, although it has borne in the past a variety of scientific names, appears to have no designation which is in accord with the Vienna Rules. These legitimize the generic name *Maclura* of Nuttall but necessitate the restoration of the earlier specific name of Rafinesque. The needed binomial and its synonymy are as follows:—

Maclura pomifera (Raf.), n. comb.

Ioxylon pomiferum Raf. Am. Monthly Mag. ii. 118 (1817).

Maclura aurantiaca Nutt. Gen. ii. 233 (1818).

Broussonetia tinctoria Spreng. Syst. iii. 901 (1826) in part, not HBK.

Toxylon aurantiacum Raf. Med. Fl. ii. 268 (1830).

T. Maclura Raf. New Fl. N. A. iii. 43 (1836).

Toxylon pomiferum Sarg. Silv. vii. 89 (1895).

B. L. ROBINSON.

ALCHEMILLA PRATENSIS FOUND AT WESTFORD, MASSACHUSETTS.— Some months ago I noticed a plant at Westford, Massachusetts, which I identified as an *Alchemilla*. To be quite sure of the determination I sent a specimen to the Gray Herbarium, but even there a positive specific identification could not be made until some identical specimens from Nova Scotia had been forwarded to Dr. Buser, of Geneva, a well known specialist on the genus. Dr. Buser pronounced the plant *A. pratensis* F. W. Schmidt. I am informed that this European species has become well established and abundant in several parts of Nova Scotia, but seems not to have been noticed in New England. It is therefore suggested that its occurrence at Westford, however casual, is of sufficient interest to be recorded in order that botanical collectors may be on the outlook for other New England stations. The species was found in a neighbor's back yard, where chickens were kept, and the most natural supposition is that the seed was introduced with chicken-feed. There were in all five individuals, one large and the others apparently recent seedlings from it. Although the flowers are small and inconspicuous the species is an attractive one, and in our flora it will be pretty easily recognized by its orbicular deeply cordate and shallowly 7–9-lobed leaves. — EMILY F. FLETCHER, Westford, Massachusetts.

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THE OLDER TYPES OF NORTH AMERICAN VIOLETS.—I.

E. Brainerd.

An earnest effort has been made to ascertain what specific types were before the older students of Viola when they published their American species. The task is indeed a difficult one, as the type specimen is usually not extant, and the description often brief and inadequate. In some instances it would seem that the problem must be abandoned as insoluble. But as we get a clearer knowledge of our plants in the field, and learn to distinguish specific differences from fluctuating variability, we may hope also to make progress in identifying the older specific names. Fortunately, absolute proof is not necessary; if we can get nothing better, we may be content with a reasonable degree of probability.

V. obliqua Hill (Hortus Kew. 1769.) In the judgment of many students of the genus, this, the oldest name for one of our cordate-leaved violets, though published with a figure, is hopelessly vague. A species so ill-defined that Pursh could think that *V. blanda* was intended, Schweinitz that it stood for *V. cucullata,* and LeConte that it might be *V. rotundifolia,*— not to speak of its recent interpretation as *V. papilionacea* and *V. affinis,*— must surely be discarded as past recognition.

The status of the three allied species, V. cucullata, V. papilionacea and V. affinis, is much alike, and they may be best discussed together. It is now less than a decade since Prof. Greene put forth his interpretation of these old species, which for over sixty years had been merged into one. We could wish that the proof were more positive as to what Aiton, Pursh, and LeConte had before them, when giving these several names; but recent students of Viola seem

convinced that the weight of evidence sustains Prof. Greene's conclusions. Aiton's statement regarding *V. cucullata*, that the lateral petals are longer than the spurred petal, is to me a strong indication that we have correctly identified his species. Schweinitz had a most distinct and accurate conception of the plant, but unfortunately regarded it as *V. obliqua* Hill. LeConte used instead, for the very same plant, the far less ambiguous name of Aiton, *V. cucullata*; but he gave *V. papilionacea* only varietal rank, and separated from these his *V. affinis* with such hesitancy, as not to carry conviction. "Too near the preceding," (*V. cucullata*), he says, "I can find no distinctive characters except the shorter peduncles and the broader sepals." Yet he strangely overlooks a better mark of difference, expressly stated in his descriptions, that in *V. cucullata* the spurred petal is generally naked and glabrous, (superiore [petalo] ut plurimum nudo, glabro); while in *V. affinis* it is generally villous, (superiore ut plurimum villosa). After all, as Greene remarks, LeConte's drawing, still extant, is the best evidence as to what plant he had in mind.

When, however, Torrey and Gray published the first fascicle of their North American Flora, in July, 1838, *V. papilionacea* and *V. affinis* were cited as mere synonyms of *V. cucullata*; and there the matter rested till recent years. How may we account for the wide divergence between this judgment and that of to-day? Is it not due largely to the fact that formerly this group of plants were studied only in their vernal state? The three species under discussion are small stemless herbs; in spring we see nothing above ground but half-grown leaves, and scapes bearing single flowers, all much alike. Only in late summer are marked specific characters developed; then the mature leaves, the apetalous flowers, their peduncles, sepals, capsules and ripe seeds, all reveal striking differences. The plants in petaliferous flower furnished to the early botanists only vague, hardly definable hints of specific distinctness; even Torrey and Gray could see no notable differences. But when the growing plants are at hand in late summer, a child can be taught to distinguish the species.[1]

VIOLA SORORIA Willd. was published in 1806 in the Hortus Beroliensis with a detailed description and an excellent plate (no. 72). It

[1] Dr. Gray in later years was doubtless influenced in the reduction of violet species by his knowledge of the numerous intergrading forms, that connect the extreme types of the *cucullata-sagittata* group. Whether he thought this due to recent interbreeding, or not, it would support his conception of a "most polymorphous" species.

is therefore surprising that it was so constantly misinterpreted or ignored, until correctly understood in the Illustrated Flora (1897). The description calls for a stemless, violet-flowered plant, with cordate leaves pubescent beneath and on the petioles. The only two species in eastern North America combining these characters are the one to which Dr. Britton has applied the name *V. sororia*, and the northern *V. septentrionalis*. The latter is quite unlikely to have reached Berlin; and furthermore its vernal leaves in outline and aspect do not answer as well to the Willdenow plate, as do those of the Britton plant. The confusion of the older botanists regarding Willdenow's *V. sororia* may be due in part to a palpable blunder in his description, for he calls the spurred petal bearded, and the lateral petals smooth. I say 'palpable blunder' for there is not a known violet in eastern North America that bears such a flower. Through some error of observation or of memory (not without parallel) Willdenow located the beard on the wrong petal.

The first misapplication of the name *V. sororia* was made by Nuttall, who quotes it as a synonym of *V. villosa* Walt. Nevertheless, after describing his *V. villosa* var. *cordifolia*, he somewhat inconsistently remarks, that this *latter* "is decidedly the *V. sororia* figured in the Hortus Berolinensis, although the leaf is said to be pubescent beneath instead of above." Schweinitz, Torrey and LeConte perpetuate in one form or the other the error of Nuttall.

The genuine *V. sororia* Willd. was, however, too common a plant not to have been noticed under some name. The oldest synonym is the *V. asarifolia* of Pursh.[1] This was based upon a plant of low rich woods, collected in the Carolinas by Catesby in 1724,— still to be seen at Oxford in hb. Sherard. A tracing made by Prof. Fernald shows it to be a summer specimen having large tall leaves, and bearing cleistogamous flowers and an immature capsule on peduncles less than two inches long. It is so unlike the form ordinarily seen in vernal flower, that Pursh, though recognizing *V. sororia* Willd., makes the Catesby plant another species;— a blunder made by more than one botanist, who has thought to get an adequate notion of a violet by studying it only when in petaliferous flower. Pursh adds the naïve remark, "I have seen this species several times in Virginia, but generally without flowers; which has been the reason that no specimen was in my collection."

[1] Supplement to Flora, ii. 734, 1814.

LeConte also recognized the plant under two different names. It is (1) his *V. cucullata* var. γ, as both his description and one of his figures clearly show; and (2) "*V. asarifolia* Pursh," perplexingly said to have very large villous leaves, short peduncles scarcely over an inch and a half long [aestival conditions], a naked glabrous spurred petal, and for habitat Canada and northwestern New York. [? sc. and southward.]

In recent years Willdenow's plant has been variously disposed of; Mr. Witmer Stone regards it as a form of *V. palmata dilatata* Ell.; and for Prof. Greene it has furnished material for at least four new species,— *V. laetecaerulea*, *V. cuspidata*, *V. nodosa*, and *V. Dicksonii*.

V. VILLOSA Walter. This name was applied by the older American botanists to two quite distinct species. Elliott and LeConte, who were intimately acquainted with the plants of Walter's region, understood him to refer to a violet, found only south of Virginia, chiefly in pine-barrens,— densely and finely pubescent throughout,— a species allied to *V. fimbriatula*, and published in 1898 by Prof. Greene as *V. Carolina*. But Nuttall, and after him Schweinitz and Torrey, applied the name to a violet that grows on dry slopes among deciduous trees from southern New York to Georgia, chiefly along the eastern foothills of the Appalachian Mountains,— a small species allied to *V. papilionacea*,— marked by somewhat rigid silvery pubescence on the upper surface of the leaf, though elsewhere glabrous. Which of these two plants is the *V. villosa* of Walter? That it is the first of the above described species, can be shown I think beyond a reasonable doubt. I would present the three following points for consideration.

1. Walter tells us in his preface that nearly all the species in his Flora Caroliniana were found in a tract that might be bounded by a line of fifty miles. His house and the botanical garden, in which he was buried, were on the banks of the Santee River, near the middle of the great tide-water plain of the southern Atlantic States. No specimen of the upland plant, *V. villosa* of Nuttall, has ever been found in this tract or within a hundred miles of the home of Walter. But the other species, as I can testify after a recent visit, is here most abundant; frequent colonies occur along the old Charlestown road from Eutawville to the Walter plantation; it was seen on railway embankments and even in the streets of towns like Summerville. The plant could hardly have escaped the observation of Walter; and if noted in his Flora, it was surely under the name *V. villosa*.

2. This descriptive term better characterizes the plant of the lowlands than that of the uplands. The pubescence of the former is, indeed, rather short for the precise use of the word 'villosa'; but it is dense and soft, that of the petioles and peduncles being, as Prof. Greene puts it, "almost plushy." Mr. Pollard also says of it in Small's Southern Flora, "petioles usually densely villous."[1] But of the upland plant Prof. Greene remarks, "the accepted *V. villosa* is not villous; it is rather stiffly hirsutulous."

3. The opinions of Elliott and of LeConte are entitled to great weight regarding the point in question. Through the kindness of Prof. Paul M. Rea, the Curator of the Charlestown Museum, I had the privilege of examining the specimens of Viola in the Elliott herbarium, and found the plant that he had labelled *V. villosa* Walt. to be the species of the coastal plains. LeConte, than whom no botanist in the first half of the last century more diligently studied and more accurately discriminated the perplexing forms of Viola in the Atlantic States, is most emphatic in applying Walter's name to the plant of the coastal region, and not to the plant of the northern uplands. "When *V. villosa* is misunderstood," he justly remarks, alluding to Nuttall and Torrey, "it is simply by authors who have never seen it."[2] LeConte's description of the two species as well as his accurate figures, now in the possession of Prof. Greene, confirm these conclusions. This interpretation of *V. villosa* was adopted in Torrey and Gray's No. Am. Flora, in 1838, and is the one maintained in all the many editions of Eaton's Botany published after 1830.

The true *V. villosa* Walt. has the unique habit of bearing apetalous flowers and fruit in the winter and early spring, before bearing petaliferous flowers. Much of the autumn foliage remains green through the winter, and specimens that I collected the last week in March had abundance of ripe seed but no petaliferous flowers. In no. 31 of Greene and Pollard's distribution of No. Am. Violaceae are to be seen both flowering and fruiting specimens of this species, collected March 30 and April 19; but the fruit is from cleistogamous flowers and was evidently obtained on the earlier date, the flowers on the later.

The other species, that is currently passing as *V. villosa*, will need

[1] It should be understood that both these authors are here speaking of *V. Carolina*, apparently not suspecting it to be Walter's *V. villosa*.

[2] "Cum *V. villosa* confusa, auctoribus duntaxat quibus nunquam visa." Ann. N. Y. Lyceum, ii. 144.

to have a name of its own, and I would designate it by a similar epithet descriptive of its upper leaf-surface:—

Viola hirsutula, nom. nov. (*V. villosa* Nutt. and recent authors, not Walter; *V. sororia* LeConte and Eaton, not Willdenow).

V. villosa var. *cordifolia* Nutt. has been a source of more or less confusion. Judging from the very full description in both Nuttall and Schweinitz, it was probably based on a hybrid between *V. hirsutula* and *V. papilionacea*, found in "dry woods on the banks of the Schuylkill near Philadelphia." Such a hybrid, from two stations now within the limits of that city, I have had growing for two seasons. The plants were found in company with the two above named species, possess intermediate characters, and show much impaired fertility. But their hybrid origin is positively demonstrated by the behavior of their seedlings, which presented last summer, in strikingly diverse forms, the divergent characters of the parents. For example, some seedlings had the small leaves of *V. hirsutula*, others the large leaves of *V. papilionacea*; some bore purple capsules like *V. hirsutula*, others light green capsules like *V. papilionacea*; some produced the pale yellow seeds of *V. hirsutula*, others the almost black seeds of *V. papilionacea*. This bybrid has also been collected by Mr. W. DeW. Miller in Plainfield, N. J.; and by Prof. House in the District of Columbia, and was published by him in RHODORA viii. 121, as *V. papilionacea* × *villosa*. It should rather be designated:—

V. hirsutula × **papilionacea**. (*V. villosa*, var. *cordifolia* Nutt.; *V. cordifolia* Schweinitz; *V. villosa*, var. *cordata* Torr., Flora i. 252, 1824; the change in varietal name being plainly an inadvertence.)

MIDDLEBURY COLLEGE, Middlebury, Vermont.

CATHARINAEA MACMILLANI.

EDWARD B. CHAMBERLAIN.

(Plate 74.)

IN the spring of 1906 Miss A. L. Crockett of Camden, Maine, sent the writer a small package of mosses. On account of other duties, the specimens were not examined closely at the time. Last November, however, when the subject was again taken up, it was found that

one packet contained fruiting material of a *Catharinaea* which seemed totally unlike any species described in the current manuals. The plant was conspicuous by its small size, stiff erect habit, and its crisped, closely inrolled leaves. Microscopic study showed it to differ from the other species of the genus in its papillose leaves with numerous, large lamellae. By comparison with specimens at the New York Botanical Garden, the specimen was determined as *Catharinaea Macmillani*, a species described in 1903 by Prof. J. M. Holzinger from sterile plants collected at Ortonville, Minnesota. This determination has since been verified by Prof. Holzinger. Search in the herbarium of the New York Botanical Garden brought to light several specimens from the herbarium of the late C. F. Austin, which in all essential characteristics agreed with the plant in question. Some of these specimens bore a manuscript name, which shows that Austin had already noticed the peculiarity of the plant.

The plants show some variation in size, and in the number and height of the lamellae; but are at once distinguishable by the papillosity of the leaves and lamellae, a character which seems to be unique in the genus. Since the original collection was sterile, and the characterization of the species brief, it seems best to publish here a full description, drawn from the fruiting specimens collected by Miss Crockett, and verified by comparison with a fragment from the original collection. The species is most closely related to *Catharinaea angustata*, Brid., of which it might be regarded as a derivative due to exposed conditions. My thanks are especially due to Mrs. E. G. Britton, Prof. Holzinger, and Prof. J. F. Collins for assistance in the study of the specimens.

CATHARINAEA MACMILLANI, Holzinger. Minn. Bot. Studies. Ser. 3: Part II: 120. (1903). *Dioecious*, archegonia in the axils of the inmost comal leaves. *Gametophyte* 2–2.5 cm. high, dull olive or reddish green, brownish below. Stems erect, simple or branched from near the base, naked or with a few rhizoids below. Lowest leaves scale-like and feebly developed, gradually larger and forming irregular rosulate tufts above, patent when moist, crisped and somewhat spirally contorted when dry, oblong-linear, 2–3 × 0.5 mm., not sheathing at the base, slightly undulate in the upper third, with 2–3 oblique rows of strong dorsal teeth, acute, often ending in a spiny point. Margin of two rows of linear, thickened cells in two layers, serrate in the upper third, the teeth double and becoming more prominent toward the apex. Costa stout, semiterete, about one fifth the median width of the leaf, percurrent or nearly so, composed in cross-

section of a dorsal row of thick-walled, papillose cells, two stereid bands separated by a double row of median guides, and a ventral row of larger cells from which arise 5–9 lamellae. Lamellae minutely crenulate in side view, 6–10 cells high, terminal cell wall not noticeably thickened, but usually with 2–3 low papillae. Leaf-cells round-hexagonal above, strongly chlorophyllose, becoming more hyaline and rectangular below, median cells 12–16 μ in diameter, somewhat moniliform in section, usually with 1–3 low papillae on each surface. *Sporophyte*, usually solitary, occasionally two. Seta 30–50 mm. long slender, smooth, brownish. Capsule 1.5–2.5 × 0.5–0.7 mm., cylindric, tapering slightly at the base, erect, straight or slightly curved, smooth, areolation rectangular below with the lateral walls much thickened, five or six rows of the cells at the orifice quadrate and incrassate, darker colored. Operculum convex, rostrate, beak at times three-quarters as long as the urn, deep red. Calyptra cucullate, equalling urn, rough at the apex. Peristome nematodontoid, of 32 linear, acute, papillose teeth, from a basal membrane one third the total height, central portion red, margin pale and minutely crenulate, attached by apices to the epiphragm.

Plate 74, figures 1–9.

Illustration: Holzinger, loc. cit. pl. 19.

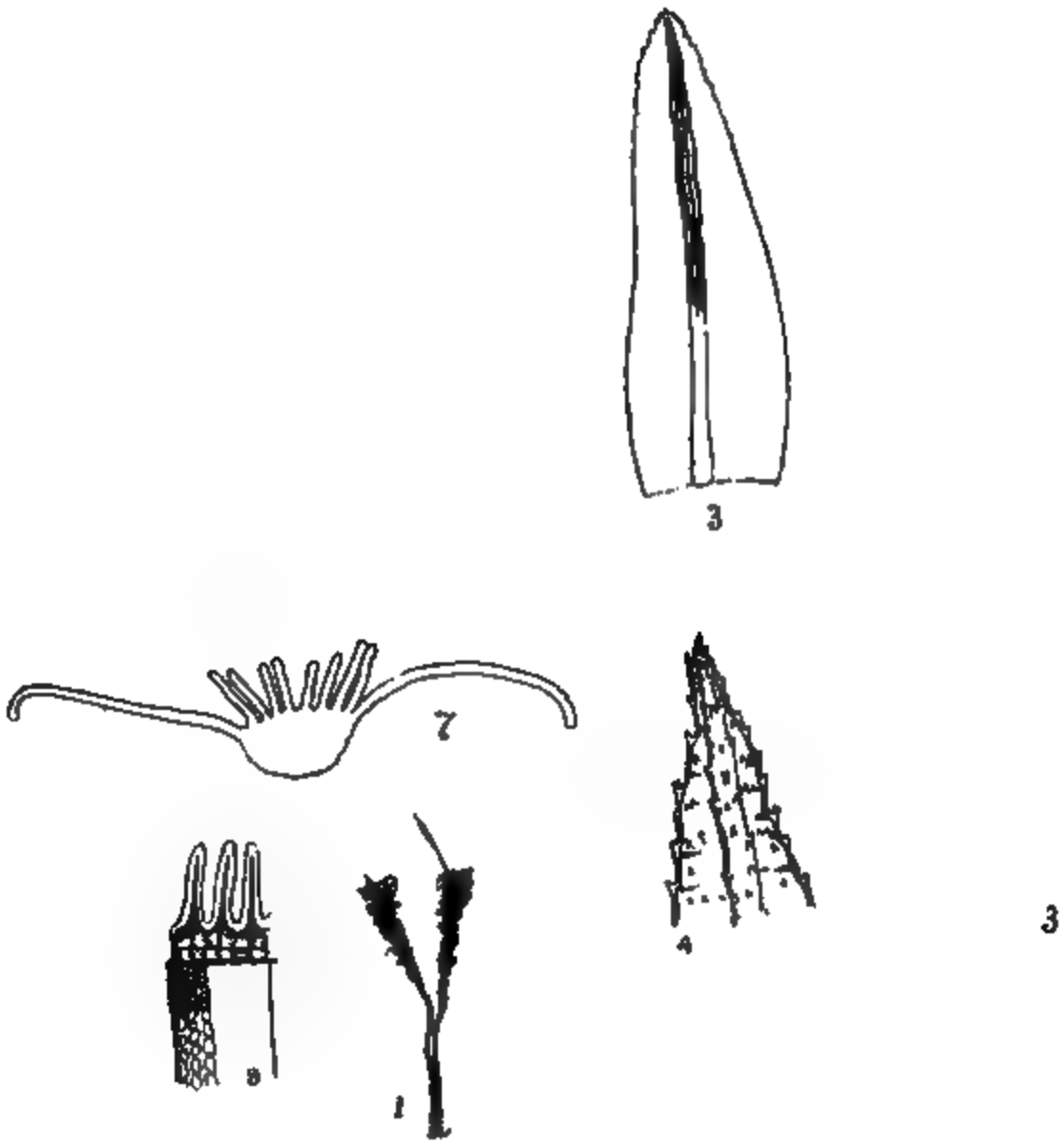
Habitat: dryish, sterile soil, often in large turfs.

Distribution: Ortonville, Minn., *J. M. Holzinger*, 1901. (type). Camden, Maine, *A. L. Crockett*, No. 163. 1903. North Haven, Conn., *G. E. Nichols*, 1907. Camden, N. J., *Parker*. Closter, N. J., *C. F. Austin*. Salina Co. Missouri, 1890, *C. H. Demetrio*.

NEW YORK CITY.

EXPLANATION OF PLATE 74.

Fig. 1. Plant in dry condition, natural size.
Fig. 2. Portion of a moistened plant, × 6.
Fig. 3. Leaves from upper, median, and lower parts of the stem, × 12.
Fig. 4. Apex of leaf from back, × 25.
Fig. 5. Areolation of upper margin, median leaf, × 225.
Fig. 6. Areolation of basal margin, median leaf, × 225.
Fig. 7. Outline median cross-section of leaf, × 50.
Fig. 8. Detail of same cross-section, × 225.
Fig. 9. Portion of peristome, × 50.



E. B. Chamberlain del.

CATHARINAEA MACMILLANI Holtz.

A SYNOPSIS OF THE NEW ENGLAND SPECIES OF PLEUROTAENIUM.

JOSEPH A. CUSHMAN.

(Plate 75.)

WHILE the New England desmids have had much less attention given to them than has been given to those of the British Isles, there are nevertheless ten species of *Pleurotaenium* known from New England. There are but nine species of *Pleurotaenium* given in Wests' British Desmids. Four of our species have not been reported from the British Isles. The species are all comparatively large and conspicuous and are easily distinguished from one another. They fall naturally into three groups. The majority of the species of the genus have straight sides or in certain cases slightly undulate. The species of the second group including *P. nodosum* and *P. constrictum* have definite enlarged portions or annulations. The third group is represented by the single species *P. verrucosum*, which has the surface divided into rectangular areas in more or less distinct rings. Our species with their several varieties are given below and their distribution in New England as far as known. The records followed by an exclamation point are those from which specimens have been seen by the writer. In most points the recent monograph of the Wests has been followed. A key to the New England species is given here, based in part upon that of the Wests.

PLEUROTAENIUM Nägeli, 1849.

Cells cylindrical, circular in end view, sides straight or somewhat sinuate; semicells with a basal inflation and often with secondary ones distally, apex truncate, usually with a ring of tubercles; chloroplasts several, in irregular longitudinal bands parietally arranged.

KEY TO THE NEW ENGLAND SPECIES OF PLEUROTAENIUM.

I. Cells cylindrical or slightly attenuated, end view circular, sides nearly straight or very slightly sinuate toward the base of the semicell, or evenly curved from base to apex, not prominently sinuate and without a thickened surface pattern.

1. Apices furnished with a ring of tubercles.
   A. Cells broadest at or near base of semicells.
      a. Cells 10–15 times as long as wide . . . *P. coronatum.*
      b. Cells 6–9 times as long as wide . . . . *P. truncatum.*
      c. Cells 15–18 times as long as wide. . . . *P. Ehrenbergii.*
   B. Cells broadest in middle of semicells. . . . *P. subgeorgicum.*
2. Apices usually without tubercles.
   A. Cells of medium size, basal inflation not usually prominent. *P. Trabecula.*
   B. Cells very large, basal inflation prominent. *P. maximum.*

II. Cells with a surface pattern of quadrilateral thickenings, ends circular. *P. verrucosum.*

III. Cells with a few broad constricted areas, sides very sinuate. *P. constrictum.*

IV. Cells with rings of nodules, end view sinuate-stellate. *P. nodosum.*

PLEUROTAENIUM CORONATUM (Bréb.) Rabenh., Flor. Europ. Algar., III, 1868, p. 143; *Docidium coronatum* Bréb., in Ralfs, Brit. Desm., 1848, p. 217, Pl. XXXV, f. 6; Wolle, Desm. U. S., 1884, p. 49, Pl. XI, f. 9–10. Cells large, 10–15 times as long as wide, gradually attenuated from base to apex, prominent basal inflation, sides undulate, apex truncate with 6–8 blunt tubercles. Length 340-575 μ; breadth at base 34–63 μ; apex 27–40 μ.— Me.: Bridgeton! N. H.: Noone's Station!; Pudding Pond, North Conway! Mass.: Lake Quinsigamond, Worcester (*Stone*); Plainville! Randolph! Bridgewater!

P. CORONATUM var. FLUCTUATUM West, Jour. Linn. Soc. Bot., Vol. XXIX, 1892, p. 118, Pl. XIX, fig. 11. Cells considerably larger than in the typical form, 12–14 times as long as broad, sides of semicells undulate for their entire length. Length 850–900 μ; breadth at base 65–72 μ; apex 46–50 μ — N. H.: Intervale! Mass.: Lake Watuppa, Fall River! This is one of the largest of our desmids and is easily visible without a lens. It is not common.

P. CORONATUM var. NODULOSUM (Bréb.) West, Jour. Linn. Soc. Bot., Vol. XXIX, 1892, p. 119. *Docidium nodulosum* Bréb. in Ralfs, Brit. Desm., 1848, p. 155, Pl. XXVI, fig. 1. Semicells with the basal inflation and apical tubercles much reduced. Length 560 μ; breadth at base 65 μ; apex 46 μ.— Mass.: Amherst (*W. West*); Salem (*Bailey*). R. I.: Wainskut pond, North Providence (*Bailey*). I have not found this variety myself in New England although it has several times been reported by others. The measurements are given from an Ohio specimen which was typical.

P. TRUNCATUM (Bréb.) Näg., Gatt. Einz. Alg., 1849, p. 104. *Closterium truncatum* Bréb. in Chev., Micr., 1839, p. 272. *Docidium truncatum* Bréb. in Ralfs, Brit. Desm., 1848, p. 156, Pl. XXVI, fig. 2; Wolle, Desm. U. S., 1884, p. 48, Pl. IX, figs. 6 & 7. Cells large, 6–9 times as long as wide, decidedly attenuated towards the apex, 11–15 apical tubercles, their bases depressed below the actual end of the semicell; cell wall coarsely punctate. Length 450–520 μ; breadth 53–80 μ; apex 37–45 μ.— Me.: Orono (*Harvey, W. West*). Mass.: Pondville! Carver's Pond, Bridgewater! This does not appear to be common in New England, as it has appeared in but two of the many lots of material examined. It seems to be common in the British Isles, however, and has a wide distribution elsewhere.

P. EHRENBERGII (Bréb.) DeBary, Conj., 1858, p. 75. *Docidium Ehrenbergii* Bréb. in Dict. Univ. Hist. Nat., 1844, Vol. V, p. 93. Cells of medium size, 15–18 times as long as wide, somewhat attenuated towards the apices, a basal inflation and one or two additional ones above it; apices with 7–9 tubercles, cell wall punctate. Length 350–496 μ; breadth 21–32 μ; apex 12.5–19 μ.— Mass.: Tewksbury (*Lagerheim*)! Randolph! Halifax! Lake Watuppa, Fall River! Nantucket! Although this is the most frequent species of the genus in the British Isles according to the Wests, in New England there are other species that occur more frequently.

P. EHRENBERGII var. ELONGATUM West, Jour. Linn. Soc. Bot., Vol. XXIX, 1892, p. 119. Cells narrow and much elongated, about 25 times longer than the diameter. Length 573–660 μ; breadth 25–30 μ; apex 19–22 μ.— N. H.: Pudding Pond, North Conway! Mass.: Halifax!

P. EHRENBERGII var. UNDULATUM Schaarschm., Magyar Tudom. Akad. Math. s. Termeszettud. Kozlemenyek., Vol. XVIII, 1882, p. 278, Pl. I, fig. 21. Cells larger than in the typical form and with the sides undulate throughout their length. Length 496 μ; breadth 25 μ; apex 15 μ.— N. H.: Pudding Pond, North Conway!

P. TRABECULA (Ehrenb.) Näg., Gatt. Einz. Alg., 1849, p. 104, Pl. VI, fig. A. *Closterium Trabecula* Ehrenb., Beitr. zur Kentniss der Organis. der Infus., 1830, p. 62. *Docidium Trabecula* Wolle, Desm. U. S., 1884, p. 48, Pl. IX, figs. 2–4, Pl. XII, figs. 1–7. Cells large, 9–19 times as long as wide, sides of semicells nearly straight, apices rounded truncate, usually without tubercles. Length 320–620 μ; breadth at base 25–44 μ; apex 23–27 μ.— Me.: Orono (*Har-*

vey); Kittery, common! N. H.: North Woodstock! Noone's Station! Mass.: Near Salem (*Bailey*); Amherst (*W. West*); Reading! Plainville! Carver's Pond, Bridgewater! Long Pond, Tewksbury! Nantucket!

P. TRABECULA forma GRANULATUM G. S. West, Jour. Bot., Vol. XXXVII, 1899, p. 113, Pl. CCCXCVI, fig. 6. "Cell wall distinctly and irregularly granulate." Length 505 μ; breadth at base of semicells 34 μ; apex 28 μ.— N. H.: Mt. Moosilauke!

P. TRABECULA forma CLAVATUM (Kütz.) W. & G. S. West, Bot. Trans. Yorks. Nat. Union, Vol. V, 1902, p. 58. *Docidium clavatum* Kütz. in Ralfs, Brit. Desm., 1848, p. 156, Pl. XXVI, fig. 3; Wolle, Desm. U. S., 1884, p. 48, Pl. IX, fig. 8. "Cells about 12 times longer than their diameter; semicells slightly tumid and subclavate." Length 360 μ; breadth at base, 31 μ; apex 25 μ.— Mass.: West Bridgewater!

P. TRABECULA var. RECTUM (Delp.) W. & G. S. West, Brit. Desm. Vol. I, 1904, p. 212, Pl. XXX, figs. 9–10. *Pleurotaenium rectum* Delp., Mem. R. Accad. Scienze di Torino, ser. 2, Vol. XXX, 1877, p. 129, Pl. XX, figs. 8–11. Cells smaller than the typical, 12–15 times as long as wide. Length 250 μ; breadth at base of semicells 18.5 μ; apex 15 μ.— N. H.: North Woodstock! Mass.: North Eastham (*F. S. Collins*)!

P. SUBGEORGICUM Cushman, RHODORA, Vol. VII, 1905, p. 117, Pl. LXI, fig. 4. Cells large, 12–15 times as long as wide, semicells widest at a point more than midway from the isthmus, thence tapering gradually to either end; basal portion with several inflations, remaining portion of the sides smooth; apex truncated, with a crown of 10 bluntly rounded tubercles. Length 600–700 μ; breadth at base 30–35 μ; at middle of semicells 45–58 μ; apex 25–30 μ.— N. H.: North Woodstock!

P. MAXIMUM (Reinsch) Lund., Nova Acta Reg. Soc. Scient. Upsala, ser. 3, Vol. VIII, 1871, p. 89. *Docidium maximum* Reinsch, Spec. Gen. Alg., 1867, p. 140, Pl. XX. C, figs. 1–2. *D. Archeri* Wolle, Desm. U. S., ed. II, 1892, p. 51, Pl. XII, fig. 2. Cells large, 14–18 times as long as wide; apices truncate with rounded angles; prominent basal inflation. Length 600–850 μ; breadth at base 40–55 μ; apex 22–30 μ.— Me.: Orono (*W. West*). Mass.: Amherst (*W. West*).

P. INDICUM (Grun.) Lund., Nova Acta Reg. Soc. Scient. Upsala, ser. 3, Vol. VIII, 1871, p. 90. *Docidium indicum* Grun., Desmid. Banka, 1865, p. 13, Pl. II, fig. 18. Length 630 μ; breadth at base

21 μ; apex 16 μ.—Mass.: Tewksbury (*Lagerheim*). This species rests upon this record and could not be verified although many of the records of Lagerheim have been gone over by the writer from some of the material from which Lagerheim took his desmids. For the present it must remain as a single record.

P. CONSTRICTUM (Bail.) Wood, F. W. Algae N. Am., 1873, p. 121. *Docidium constrictum* Bail. in Ralfs, Brit. Desm., 1848, p. 218, Pl. XXXV, fig. 7. Wolle, Desm. U. S., 1884, p. 50, Pl. XI, fig. 2. Cells large, 12–15 times as long as wide, very slightly attenuated from base to apex; a prominent basal inflation and three or four others in each semicell; apices truncate with a peripheral ring, usually 8 large bluntly pointed tubercles, membrane evenly punctate; basal inflation occasionally with small plications, usually 8 in number. Length 435–560 μ; breadth at base 40–50 μ; apex 25–32 μ.—N. H.: Laconia, scarce, (*Wests*); Pudding Pond, North Conway! Mass.: Tewksbury (*Lagerheim*). R. I.: Worden's Pond, North Providence (*Bailey*).

P. NODOSUM (Bail.) Lund., Nova Acta Reg. Soc. Scient. Upsala, ser. 3, Vol. VIII, 1871, p. 90. *Docidium nodosum* Bailey in Ralfs, Brit. Desm., 1848, p. 218, Pl. XXXV, fig. 8. Wolle, Desm. U. S., 1884, p. 50, Pl. XI, figs. 11–12, Pl. XII, fig. 20. Cells large, 7–10 times as long as wide, semicells with rings of nodules, usually four in number including the basal ring and equidistant, 6–8 nodules in each ring; apices dilated, with a ring of 6–8 tubercles. Length 300–460 μ; breadth at base 40–70 μ; apex 28–40 μ.—Me.: Orono (*Harvey*). N. H.: Laconia (*Wests*); Pudding Pond, North Conway! Intervale! Noone's Station! Mass.: Near Salem (*Bailey*); Lake Quinsigamond, Worcester (*Stone*); Carver's Pond, Bridgewater! R. I.: Wainskut Pond, North Providence (*Bailey*). This seems to be one of the commonest species of the genus in New England. It is rare in the British Isles.

P. VERRUCOSUM (Bail.) Lund., Nova Acta Reg. Soc. Scient. Upsala, ser. 3, Vol. VIII, 1871, p. 6. *Closterium verrucosum* Bail., Am. Jour. Sci., n. s. Vol. I, 1846, p. 127, fig. 4. *Docidium verrucosum* Bail. in Ralfs, Brit. Desm., 1848, p. 218. Wolle, Desm. U. S., 1884, p. 52, Pl. X, figs. 4–5. Cells of medium size, about 10–15 times as long as wide, semicells with straight sides, slight inflation at the base, cell wall with 13–15 rings of irregularly quadrilateral areas, the last ring distally more elongated than the others. Length 400–460 μ; breadth at base 30–40 μ; apex 22–30 μ.—N. H.: Pudding Pond, North Conway, frequent! Mass.: Mt. Everett (*Wolle*). R. I.: Near Providence (*Bailey*).

EXPLANATION OF PLATE 75.

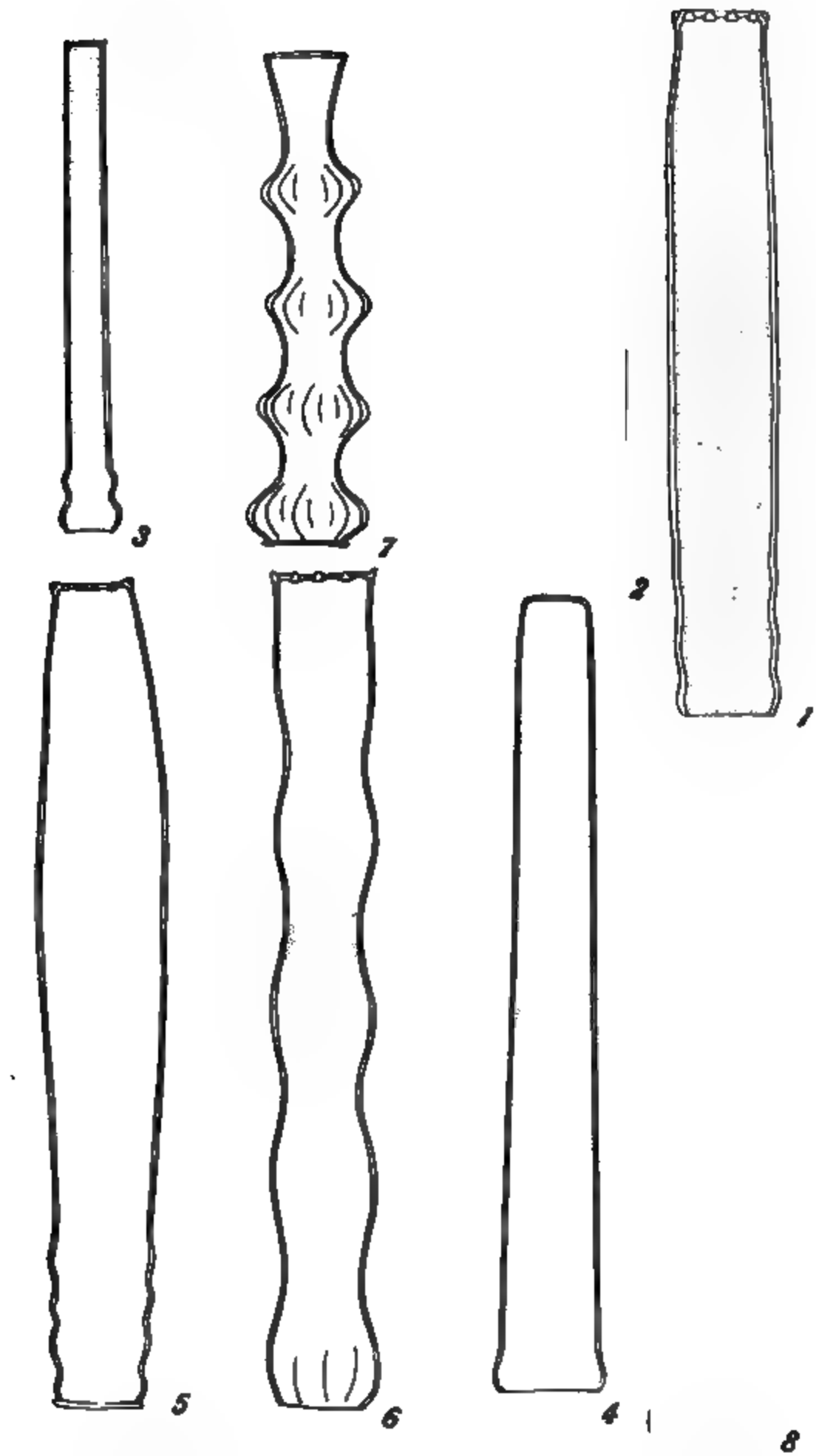
Fig. 1. Pleurotaenium coronatum (Bréb.) Rabenh., × 351.
Fig. 2. " truncatum (Bréb.) Näg. (after W. & G. S. West) × 310.
Fig. 3. " Ehrenbergii (Bréb.) DeBary, × 350
Fig. 4. " Trabecula (Ehrenb.) Näg., × 350.
Fig. 5. " subgeorgicum Cushman, × 350.
Fig. 6. " constrictum (Bail.) Lund., × 350.
Fig. 7. " nodosum (Bail.) Lund., × 350.
Fig. 8. " verrucosum (Bail.) Lund., × 350.

STREPTOPUS OREOPOLUS A POSSIBLE HYBRID.—In April, 1906, I described from the alpine region of Mt. Albert, Gaspé Co., Quebec, as *Streptopus oreopolus*[1] a plant which in some ways combined characteristics of *S. amplexifolius* and *S. roseus*, but in its deep claret-colored perianth was unlike either. The original description was based upon simple or subsimple alpine specimens, and at that time the plant was known only from a limited area on Mt. Albert.

During the summer of 1906, however, Professor J. Franklin Collins and the writer found *Streptopus oreopolus* in company with *S. amplexifolius* and *S. roseus* abundant along alpine brooks on the northern hornblende slopes of Mt. Albert, and in extreme abundance everywhere on alpine meadows and in the open park-like subalpine forests of the granitic tableland of Table-top Mountain. In fact, on Table-top Mountain *S. oreopolus* impresses one as perhaps the most abundant plant of the cool slopes and alpine meadows, always more abundant than *S. roseus* and *S. amplexifolius*, maintaining its slightly ciliate-hispid stems and leaves (pronouncedly less ciliate than in *S. roseus*) and its attractive flowers, in form and structure like those of *S. amplexifolius* but always a deep claret-purple in color.

Since the fruit of this local plant of the Gaspé mountains was still unknown we took special interest in examining daily, through our four weeks' residence in the alpine areas, the colonies of *Streptopus*. The result of a very close observation of the plants over an area of about one hundred square miles was that, while both *S. roseus* and *S. amplexifolius* were found to mature abundant fruit, not a single plant of *S. oreopolus* could be found with even a vestige of good fruit. In

[1] RHODORA, VIII, 70 (1906).



J. A. Cushman del.

NEW ENGLAND SPECIES OF PLEUROTAENIUM

fact, all the plants examined had merely dry shriveled and hollow ovaries. This uniform sterility of *S. oreopolus* throughout its known range suggests that it may not be a self-perpetuating species; yet, if this should prove to be the case, the profusion of the plant throughout the area and the constancy with which it maintains its characteristic pubescence and the color of its perianth is indeed remarkable. It is of course possible that the sterility of the plants in 1906 was exceptional and due perhaps to the extremely dry weather during early summer, the valley of the lower St. Lawrence experiencing a drouth quite unprecedented in that ordinarily cold and humid region, or that it depends for fertilization upon some insect which was affected by the adverse season; but the abundant fruiting of *S. roseus* and *S. amplexifolius* indicates that the unusual dryness had no adverse effect upon those species.

It is worth recording that in the mountains of Gaspé *Streptopus amplexifolius* and *S. roseus*, as well as *S. oreopolus*, show a great variation in size. All three plants in rich subalpine woods become very tall and branched, often 1 m. or more in height, but in alpine situations they are much reduced, the simple or subsimple stems 2 or 3 dm. high.— M. L. FERNALD, Gray Herbarium.

THE THIRTEENTH ANNUAL MEETING OF THE JOSSELYN BOTANICAL SOCIETY will be held at Oxford, Maine, from Monday to Saturday, July 1–6, 1907, inclusive. The headquarters of the society will be at the Belmont Lodge Hotel, Oxford. Boats upon Thompson Lake will be at the disposal of the party and it is planned to make one all day excursion upon the lake. An opportunity will also be given to visit the famous orchid swamps at Hebron. To secure the favorable rates given below, it is absolutely necessary to know immediately how many members will attend. You are requested, therefore, to communicate your plans to the undersigned at once, whether planning to attend or not. Reduced rates of 1¾ cents per mile have been secured on the Maine Central Railroad, and its is expected that a similar rate will obtain upon the Grand Trunk Railroad. Hotel Rates: One or two in room $2.00 per day.— EDWARD B. CHAMBERLAIN, 38 West 59th Street, New York City.

THIRTEENTH ANNUAL FIELD MEETING OF THE VERMONT BOTANICAL AND BIRD CLUBS will be held at No. Pownal, Vt. on Tuesday and Wednesday, July 2 and 3. Headquarters will be at Hotel Glenwood, where the members and their friends will assemble on the evening of July 1. Tuesday, July 2, will probably be given to exploring the cliff region of Pownal Center. Wednesday, July 3, will be devoted to the bog regions of the river valley.

There are three routes which may be taken by the Vermont members in reaching No. Pownal, as follows,

Route 1, via Bellows Falls, Brattleboro, Greenfield, No. Adams, No. Pownal.

Route 2, via Rutland, No. Bennington, Hoosac Junct., No. Pownal.

Route 3, via Rutland, Castleton, Eagle Bridge, No. Pownal.

Members taking Route 2, upon reaching No. Bennington may choose between going via Hoosac Junct. to No. Pownal, or via Bennington, Petersburg Junct., to No. Pownal, or may transfer at Bennington to electric car.

Electric cars now run through Pownal from Hoosac Junct. Williamstown and Bennington. Rates at Hotel Glenwood, $1.00 per day.— D. S. CARPENTER, Sec'y Arrangements, Middletown Springs, Vt.

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Rhodora

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SOME NEW OR LITTLE KNOWN FORMS OF NEW ENGLAND TREES.

ALFRED REHDER.

THE following descriptions of some little known varieties and forms of trees are presented here chiefly for the purpose of drawing the attention of collecting botanists to these variations. Trees and particularly the more common trees are often passed by by botanists, and therefore are usually not well represented in our collections, a fact that makes it difficult to trace the frequence of unexpected forms. We have still much to learn even in a so comparatively well explored region as New England in regard to the distribution of certain varieties and the frequence of the occurrence of certain forms of trees. That forms like the virgate form of the Red Spruce and the cut-leaved forms of Sumach due to spontaneous mutation may occur repeatedly and independently, has been shown by the observation made in Europe on allied species. We also may be on the look out for similar forms in other species or genera.

Picea mariana var. **brevifolia** comb. nov.— *P. brevifolia* Peck, Spruces of the Adirondacks, 13 (1897); Britton, Ill. Flor. **3**: 496 fig. 122a (1898); Man. 34 (1901); Brotherton, Amer. Gard. **21**: 201, 2 fig. (1900).— *P. nigra* var. *brevifolia* Rehder, Bailey's Cycl. Am. Hort. **3**: 1334 (1901).

Differs from the type chiefly in its smaller glaucous leaves. It is a small tree, rarely exceeding 10 m. in height with a narrow spire-like head of irregular outline; leaves 4–12 mm. long, stout, obtuse or mucronate, glaucous; cones 1.2–2.5 cm. long, the scales with erose margins; seeds 2 mm. long, with wings 4–5 mm. in length.

This variety is credited by Britton to Vermont, but I fail to find

in the herbariums consulted any specimens from this state. There are, however, the following specimens from Maine and New Hampshire which are referable to this variety. MAINE: Bangor bog, Orono, July 20, 1892, *M. L. Fernald*; Somerset Co., peat bog, Flagstaff, Aug. 19, 1896, *M. L. Fernald*; Piscataquis Co., Mt. Ktaadn, July 8, 1900, *J. R. Churchill.* NEW HAMPSHIRE: summit of Thorn Mtn., Jackson, Oct. 4, 1896, *C. E. Faxon.* *Picea mariana* var. *brevifolia* inhabits chiefly mountain bogs and is distributed outside of New England to Ontario, northern New York and Michigan. The low prostrate form of the exposed tops of high mountains described by Peck as *P. brevifolia* var. *semiprostrata*, will probably also be found in New England. A form similar in habit and in the size of leaves and cones which I found on top of Mt. Mansfield in Vermont is apparently a low form of the true *P. mariana*, as it has dark green leaves.

Picea rubra forma **virgata** comb. nov.— *Picea mariana* "monstrous form" Gard. & Forest **8**: 45 fig. (1895).— *Picea rubens* "form" Sargent, Sylv. N. Am. **12**: 33 (1898).— *Picea nigra* var. *virgata* Rehder; Bailey's Cycl. Am. Hort. **3**: 1334 (1901).

Differs from the type by the long and slender branches entirely destitute of branchlets.

MASSACHUSETTS: on the base of Mt. Hopkins near Williamstown, one plant found by Mr. George Walker and specimens with a photograph sent by Samuel F. Clarke in 1894 to the Arnold Arboretum.

A very peculiar looking Spruce and interesting as a parallel form to **P. Abies** f. **virgata** (*P. excelsa* var. *virgata* Caspary), Schlangenfichte (Snake-Spruce), found in quite a number of localities in central and northern Europe, particularly in Norway. A comparison of the figure given in Garden & Forest (l. c.) of the "snake" form of *P. rubra* and of the figures of *P. Abies* f. *virgata* published by Carrière (Rev. Hort. 1854: 102) and by Schübeler (Viridarium Norwegicum **1**: 411, fig. 69. 1886 and Gartenfl. **1**: 521. 1887) show that there is hardly any difference in habit between these forms of the two species. It may be reasonably expected, that other plants of this form of *P. rubra* will be discovered in time, as the European Snake-Spruce also has been found many times, usually only in single plants which undoubtedly originated independently by mutation, and sometimes in colonies; in the latter case they were probably seedlings of a single mother tree. The offspring of the Snake-Spruce represents partly the true snake form and partly forms intermediate

between this form and the type of the species; such was at least the case in a number of seedling plants I saw in the park at Reinhardtsbrunn in the Thuringian Mountains. Trees propagated by grafting are planted occasionally in European gardens. *Picea rubra* f. *virgata* may now likewise be found in some gardens, for Prof. S. F. Clarke stated in a letter to Prof. C. S. Sargent, that Mr. G. Walker made cuttings of this Spruce. A grafted plant of this form lived in the Arnold Arboretum for years but died unfortunately a few years ago.

BETULA LENTA L. forma **laciniata** f. n.—*Betula lenta* "form" Sanford, RHODORA **4**: 83. (1902.)

A typo differt foliis inciso-lobatis, lobis utrinque 6–9 argute serratis, inferioribus circa 1 cm. longis apicem versus decipientibus et in serraturas angustas acuminis transeuntibus.

Differs from the type by the incisely lobed leaves. Leaves 6–8 cm. long, subcordate or truncate at the base, long acuminate on each side with 6–9 ovate-lanceolate, sharply serrate and acuminate lobes, the lower ones about 1 cm. long and gradually passing into the sharply serrate apex.

NEW HAMPSHIRE: New Boston, Aug. 1901, *S. N. F. Sanford* (Herb. Gray) and July 31, 1902, *E. W. Morse*, (Herb. Arnold Arboretum).

This is interesting as a parallel form to the Old World *Betula pendula f. dalecarlica* (L.) C. K. Schneider and *Betula alba* var. *urticifolia* Regel, both of which have been repeatedly found wild in Scandinavia. Of the form here described only a single tree of about 12 feet height has been found by Mr. Sanford near New Boston at an altitude of about 1200 feet as stated by him in the article referred to above. Judging from his description as well as from the specimens the tree possesses ornamental qualities which would make its introduction into our gardens desirable. This could be easily accomplished by grafting and this would be done at the Arnold Arboretum, if branches were sent late in fall or during the winter to this institution.

FAGUS GRANDIFOLIA Ehrh. forma **pubescens** Fernald & Rehder, f. n.

A typo differt foliis subtus tota facie pilosis sed marginem versus saepe glabrescentibus, ad venas villosis.

Differs from the type in having the under side of the leaves short-pubescent, but toward the margin often glabrescent and the veins covered with a villous pubescence, not with long silky hairs.

MASSACHUSETTS: South Braintree, May 30, 1907 and Bee Hill near Williamstown, June 28, 1904, *Alfred Rehder*. RHODE ISLAND: Tiverton, Aug. 1879, *C. S. Sargent*. In cultivation at the Arnold Arboretum and also in Germany: Muskau (Silesia), Arboretum, July 23, 1901, *Alfred Rehder*.

The specimen from Rhode Island approaches the southern form by its very broad leaves and the somewhat shorter prickles. The specimens from the Arnold Arboretum from Muskau, which lack the fruits, are more densely pubescent than the other specimens and very like the pubescent form of the southern variety, but the foliage is that of the northern form.

Though the American Beech is usually considered a very homogenous species, the comparison of a large amount of material from the whole range of the species shows that this is not the case and that some authors, particularly the younger Michaux, have shown a very good judgment in distinguishing a northern and a southern Beech and that furthermore the description by some old authors as Aiton and Willdenow of the leaves as tomentose or pubescent beneath was quite correct as regards the technical meaning of these words and did not refer to the silky hairs of the young leaves. My attention was first drawn to these variations when I found several years ago a pubescent form in cultivation in Germany. As I recently consulted the Gray Herbarium with the intention to pursue the matter further, I learned from Professor Fernald that he also had made investigations in this respect, the results of which proved almost identical with the conclusions I had reached.

The distinction of the two geographical varieties with pubescent and glabrous forms presents no difficulties, but the nomenclature seems somewhat complicated. During the nomenclatural unrest of the two last decades the names *F. americana*, *F. atropunicea*, and *F. latifolia*, combinations based on older trinomials, had been substituted for the well known *F. ferruginea* by various American authors, but according to the Vienna rules the oldest binomial available is *F. grandifolia* of Ehrhart, which is one year older than Aiton's *F. ferruginea*. By this nomenclatorial change we avoid the rather awkward situation that a very rare form should constitute the type of this widely distributed American tree, for *F. ferruginea* Aiton is apparently based on one of the hitherto almost unknown pubescent forms of the Beech. This is shown by the description "foliis subtus tomentosis" in Hortus

Kewensis and still more conclusively by the manuscript of Solander for Aiton's Hortus Kewensis, where the habitat is quoted as "Habitat in Marylandia, Jones, in Pennsylvania Math. Hultgren." The specimen collected by Math. Hultgren in Pennsylvania in 1781 is still in the herbarium of the British Museum and has according to Mr. E. G. Baker, to whom we are indebted for a copy of the manuscript description and a tracing of the specimen, the leaves densely and softly pubescent beneath. From the published description however, it seems as if the species were based on Lee's cultivated plant. Ehrhart's *F. grandifolia* represents apparently the northern form. It was described from cultivated plants and Münchhausen's *F. americana latifolia* and Duroi's *F. sylvatica c. americana latifolia* based also on cultivated plants quoted as synonyms; these were probably of the same origin as Lee's plant, which is, according to Loudon's description and the figure of his *F. ferruginea* var. *latifolia*, the northern form and also according to a specimen in the herbarium of the Arnold Arboretum collected at Kew and labeled *F. ferruginea* var. *latifolia* (C. Lee & Son). The *F. Americana latifolia* of Wangenheim also represents the northern form. Thus the name *F. grandifolia* Ehrh. remains with the northern variety as the type and for the southern variety the first available varietal name is *F. ferruginea* var. *caroliniana* of Loudon. The synonymy and the description of the varieties and forms to be distinguished may be appended here.

FAGUS GRANDIFOLIA Ehrhart, Beytr. Naturk. **3**: 22 (1788).— *F. Americana latifolia* Muenchhausen, Hausv. **5**: 162 (1770); Wangenheim, Beytr. Forstwiss. 80, pl. 29, fig. 55, (1787).— *F. sylvatica* c. *Americana latifolia* Duroi, Harbk. Baumz. **1**: 269 (1771).— *F. sylvatica atropunicea* Marshall, Arbust. Am. 22 (1785).— *F. sylvatica* Schoepf, Mat. Med. Am. 140 (1787), not Linné.— *F. ferruginea* Aiton, Hort. Kew. **3**: 362 (1789); F. A. Michaux, Hist. Arb. Am. **2**: 174, pl. 9. (1812); Rafinesque, New Fl. **3**: 80 (1836).— *F. sylvestris*, A. Michaux, Flor. Bor. Am. **2**: 194 (1803).— *F. sylvatica β americana*, Nuttall, Gen. 2: 216 (1818); Emerson, Trees Mass. ed. 2. 180, pl. (1875).— *F. Americana* Sweet, Hort. Brit. 370 (1826); Sargent, Sylv. N. Am. **9**: 27, pl. 444 (1896).— *F. ferruginea* var. *latifolia* Loudon, Arb. Frut. Brit. **3**: 1980. fig. 1916 (1838).— *F. atropunicea* Sudworth, Bull. Torr. Bot. Club. **20**: 42 (1893).— *F. latifolia* Sudworth, Nomencl. Arb. Fl. U. S. 148 (1897).

The type of the species is characterized by the long and slender

prickles, sometimes nearly 1 cm. long, of the usually ashy gray or yellowish tomentose involucre, by the thinner texture and more yellowish green color of the distinctly serrate leaves which are usually cuneate at the base. Of the synonyms quoted above only *F. ferruginea* of Michaux and of Rafinesque and *F. ferruginea latifolia* Loudon refer to this variety as distinguished expressly from the southern variety. It is distributed from Nova Scotia to Ontario and Minnesota and in the mountains as far south as Virginia.

Forma *pubescens* is described above.

Var. **caroliniana** Fernald & Rehder, comb. nov.— *F. sylvativa* Walter, Fl. Carol. 233 (1788).— *F. sylvestris* F. A. Michaux, Hist. Arb. Am. **2**: 170, pl. 8. (1812).— *F. rotundifolia* Rafinesque, Atlant. Jour. 177. (1833).— *F. alba* Rafinesque, New. Flor. **3**: 80 (1836).— *F. heterophylla* Rafinesque, l. c.— *F. nigra* Rafinesque l. c.— *F. ferruginea* var. *caroliniana* Loudon, Arb. Frut. Brit. **3**: 1980 fig. 1915 (1838).— *F. ferruginea* Chapman, Fl. S. U. S. 425 (1860).— *F. americana* Small, Fl. S. E. U. S. 347 (1903).

Differs from the type in the shorter and fewer prickles of the densely rufous-tomentose involucre; and the generally smaller fruits not exceeding the involucre, the broader usually only denticulate leaves, often subcordate at the base, at maturity of firmer texture and of a dull dark bluish green color. The characteristic differences in the fruit between the northern and the southern variety are well brought out by the figures of Michaux; and Rafinesque's description of his *F. ferruginea* as having the "female flowers with many linear smooth bracts" shows that he, too, noticed this character. Distributed from New Jersey to Florida and west to southern Illinois, Missouri and Texas. In the border regions of the range of the northern and southern variety intermediate forms are often found and even in southern New England trees approaching the southern variety occur.

forma **mollis** Fernald & Rehder, f. n.—

Differt a varietate *caroliniana* foliis subtus tota facie dense et molliter pubescentibus.

Differs from the variety *caroliniana* by the densely and softly pubescent under side of the leaves.

FLORIDA: Tallahassee, Leon County, Aug. 7–9, 1895 *Geo. V. Nash* (No. 2339). LOUISIANA: New Orleans, 1832, *Drummond* (no. 318).

The type specimen from Florida has ovate or oval, denticulate

leaves distinctly subcordate at the base, while Drummond's specimen has elliptic-oblong leaves, cuneate at the base, and has no fruits, but from its range it apparently belongs to the southern and not to the northern variety. Whether the type of *F. ferruginea* from Pennsylvania is to be referred to f. *pubescens* or to f. *mollis* which seems more probable, must remain doubtful as long as we do not know the fruits.

RHUS TYPHINA L. forma LACINIATA Wood, Am. Bot. Flor. pt. 4: 73. (1870) as var.; Flor. Atlant. 73 (1879).

Differs from the type by the irregularly incisely dentate or incisely lobed leaflets which are ovate-oblong to lanceolate and by the leafy panicles. New Hampshire, near Hanover, 1846, *Dr. Rickau* (erroneously spelled Ricard by Wood). (Herb. Gray.)

Rhus typhina L. forma **dissecta**, nom. n.— *R. typhina* var. *laciniata* Hort. [Manning] ex Rehder, Möller's Deutsch. Gärtner-Zeit. **15**: 211. fig. (1900); Hort. ex Cowell; Bailey's Cycl. Am. Hort. **4**: 1530 (1902). —*R. hirta* var. *laciniata* C. K. Schneider, Ill. Handb. Laubholzk. **2**: 154 (1907).

Differs from the type by the bipinnately divided leaves with the leaflets of the second order linear to linear-lanceolate and entire or dentate or sometimes even pinnatifid.

MASSACHUSETTS, locality unknown; found about 15 years ago by J. W. Manning of Reading, Mass. and transplanted into his garden.

A very striking form on account of the graceful feathery appearance of the large (30–45 cm. long) finely dissected leaves. Its ornamental qualities have won for it a place in many American and European gardens particularly in more northern latitudes where the similar but more tender *R. glabra* var. *laciniata* Carr. is not hardy enough.

A few words may be said on the specific name which this species of Rhus has to bear. In 1892 Sudworth (Bull. Torr. Bot. Club **19**: 81) proposed for it the new combination *R. hirta* (L.), because Linné, prior to the publication of his *Rhus typhina* (Cent. Plant. **2**: 14. 1756; Amoen. Acad. **4**: 311. 1760) had named the same species *Datisca hirta* (Spec. Plant. **2**: 103. 1753) from an abnormal specimen with the inflorescence reverting into leaves and with partly confluent leaflets (see also Britton, Bull. Torr. Bot. Club **18**: 269). This explains his placing the plant into an entirely wrong genus. The name *R. hirta*, however, cannot be admitted, according to art. 51, 3 of the Vienna rules of nomenclature, as it is based on a monstrosity.

ACER RUBRUM L. var. TRIDENS Wood, Class Book Bot. 286. (1860); Am. Bot. Flor. pt. 4: 74. (1870); Flor. Atlant. 24. (1879); Sargent, Sylva N. Am. **13**: 11, pl. 626 (1902).— *A. rubrum* var. *β* Torrey & Gray, Flor. N. Am. 1: 249 (1838).— *A. microphyllum* Pax, Bot. Jahrb. 7: 180 (1886).— *A. semiorbiculatum* Pax. l. c. 181.— *A. rubrum* subsp. *microphyllum* Wesmael, Bull. Soc. Bot. Belg. **29**: 29 (1890); Schwerin, Gartenfl. **42**: 166 (1893) as forma — *A. rubrum* subspec. *microphyllum* Wesmael, l. c.; Schwerin, l. c. fig. 38, as forma; Pax, Engler's Pflanzenreich IV. 163: 38 (1902) as forma — *A. tomentosum* Pax, Engler's Pflanzenreich IV. 163: 38 (1902), not Desfontaines[1] and excl. syn. Marshall[2] and Kirchner.[3]

Differs from the type by having smaller leaves usually only 4 to 8 cm. long and obovate in outline, three-lobed at the apex and narrowed from below the middle into the rounded base, usually very glaucous beneath and with long-persistent pubescence, and thick and firm at maturity. The flowers are sometimes yellow and the fruits usually smaller.

MASSACHUSETTS: near Auburndale, May 17, 1904, *M. L. Fernald & Alfred Rehder.* Only one rather large tree was found. This is the most northern locality yet observed for the variety whose range extends south along the Atlantic coast through Florida into eastern Texas.

In its characteristic form the variety appears well marked, but intermediate states are often met with and three-lobed leaves are occasionally found on trees of the typical form and particularly on stunted trees growing in swamps. In the south occurs a still more

[1] The quotation Desfontaines, Tabl. Écol. Bot. ed. 3 (1829) 136 as given by Pax and also in the Index Kewensis is incorrect; the name without any description appears only in edition 1 (1804) p. 136; in the second and third edition this name and likewise the preceding name *A. coccineum* is omitted and for these two names *A. eriocarpum* Michaux substituted. From this it may be inferred that Desfontaines intended the name *tomentosum* for *A. saccharinum*, but even if an herbarium specimen should still exist and should represent the variety *tridens*, the name cannot be revived as it is indisputably a nomen nudum.

[2] The quotation of Marshall's *A. glaucum* as a synonym of *A. tomentosum* appears to be hardly more than a guess, for Marshall's very vague description does not even clearly show whether he had *A. rubrum* or *A. saccharinum* in mind.

[3] As Kirchner in his short description of *Acer rubrum* var. *tomentosum* (Arb. Muscav. 186. 1864) does not mention the most obvious character, the three-lobed leaves, and as also Count Schwerin, who made a most careful study of the cultivated Maples, describes and figures it as a variety with deeply five-lobed leaves (Gartenfl. **42**: 165 fig. 50. 1893) chiefly distinguished by the persistent pubescence of the under side of the leaves and the intensely red flowers, I do not think it advisable to consider Kirchner's name as a synonym of var. *tridens*.

extreme form in which the two lateral lobes are reduced to large teeth, so that the leaves appear undivided and only coarsely dentate and are then ovate to ovate-oblong in shape. To this form belong the following two specimens: FLORIDA, *Chapman* (herb. Gray) and MISSISSIPPI, Enterprise May 6, 1880 (herb. Arnold Arboretum). Considering the sporadic distribution of the variety *tridens* through the range of the species and the inconstancy of its characters as is clearly shown by a large number of specimens, one cannot consent to its elevation to specific rank, as was done by Pax, who in his earlier monograph distinguished even two species, *A. microphyllum* with smaller leaves very glaucous beneath and with the petiole shorter than the limb and *A. semiorbiculatum* with larger leaves, green (!) beneath and with the petiole longer than the limb, each species based apparently on a single specimen, collected by Kinn in "Am. bor." without indication of the locality. In his later monograph he reduces the latter species to a form of *A. rubrum* and substitutes for *A. microphyllum* the name *A. tomentosum*.

ARNOLD ARBORETUM.

THE FLORA OF THE GREAT SWAMP OF RHODE ISLAND.

ERNEST SHAW REYNOLDS.

THE Great Swamp of Rhode Island is a region which has long been recognized by botanists as offering a very rich collecting ground, and has often been visited by students of botany. The swamp is located in the southern part of the state, in Washington County, close to the junction of the town lines of Charlestown, Richmond, and South Kingstown. The larger part lies in South Kingstown, though a part of the western half is in the adjoining town of Richmond. It is entirely enclosed between the parallels 41° 25′ and 41° 30′ while the meridian 71° 35′ cuts the swamp area into two nearly equal portions. Excluding the part south of Worden's Pond, the swamp area covers about six square miles, which is the largest tract of land in Rhode Island bearing a swamp flora.

There are, in Washington County, at least fifty large and small swamps, and many more lakes and ponds. A large number of these are located in the glacial drift, which covers large areas in the state, and their origin can undoubtedly be traced to the glacial period. The topographical features surrounding the Great Swamp are especially favorable to the development of a swamp. West and northwest of the region, the land is well elevated above the level of Narragansett Bay, and the soil, Gloucester stony loam,[1] is porous and easily drained. The soil north and east of the swamp is of glacial origin and the land also well elevated. To the south there is a combination of soils, some of glacial origin, and some derived from the country rock. The elevations here are not so marked as on the other sides. The swamp itself, therefore, is in a basin at least a hundred feet lower than the surrounding country, and often more. Within the Great Swamp area there are two hills, a little over one hundred and fifty feet in height, which partly traverse the swamp in a north and south direction, thus offering a ready means of entering the area. On the southern edge is Worden's Pond ninety four feet above sea level and at no point more than a few feet deep. Its total length is not over two miles, and it is a little less than a mile and a quarter wide. Passing through the swamp, and entering the pond from the north are two streams, the larger called the Chipuxet River. Cutting the western half into two nearly equal divisions and serving as a boundary between the towns of South Kingstown and Richmond, is the Usquepaugh River, which eventually empties into the Pawcatuck River. Swampy land extends on both sides of these rivers for a mile and a half north of the Great Swamp proper.

The records of former botanical work done in this area are rather scattered and difficult to obtain. The most valuable data of course, are from the collections of Olney and Bennett which are largely in the Brown University Herbarium. Besides these there are scattered specimens from the collections of George Hunt, W. W. Bailey, J. W. Congdon and George A. Leland, all of whom have made trips into the swamp at rare intervals. There is no systematic record so far as known to me, of the flora of the Great Swamp region, and only occasional reference is made to it in Bennett's list of Rhode Island Plants, when he includes it in his reference to "South Kingstown." In two of Mr.

[1] See *Soil Survey of R. I.* by F. E. Bonsteel and E. P. Carr, Washington, 1905.

Olney's field note-books which are now in the possession of the Brown University Herbarium, there are notes of three trips into the swamp. These are recorded as occurring in 1846 and 1847. Without doubt other trips were made, but no more records were found. There are none of Mr. Bennett's notes accessible except his list already mentioned. In a letter recently received from the Hon. J. W. Congdon of Seattle, Washington, who formerly collected extensively in the swamp region, there are some interesting notes of his recollections of the area. Most of the plants he mentions were collected also by the writer last summer. He speaks of the relative abundance of *Habenaria ciliaris* and *H. blephariglottis* as well as of *Gaylussacia dumosa*. Besides these he gives a list of the Utricularias he has found there, namely *Utricularia biflora, clandestina, gibba, cornuta, resupinata,* and *subulata*. Growing in the muddy part of Worden's Pond were *Orontium aquaticum Lachnanthes capitata, Xyris caroliniana, Sabbatia chloroides, Lobelia Dortmanna, Juncus militaris, Rhynchospora macrostachya,* and *R. fusca*. Mr. Leland has also kindly furnished me with a list of a few plants which he has from that area: — *Linum usitatissimum, Utricularia intermedia, U. inflata, Polygonum acre, P. dumetorum* var. *scandens, P. Careyi, P. hydropiperoides, Vaccinium pallidum,* and *V. atrococcum*.

During the latter part of August, 1906, the writer was able to make eight trips into the swamp from different directions as briefly indicated below: —

1. The marshy land on the west side of the Chipuxet River about a half a mile south of the Narragansett Pier R. R.
2. The corresponding swamp east of the Chipuxet near Larkin's pond.
3. The swamp between the Shickasheen River and the N. Y. N. H. & H. track, for a couple of miles south of the Kingstown station.
4. A similar region west of the Shickasheen River.
5. The portion of the swamp lying between the two hills already mentioned.
6. A strip of swamp land including the Fighting Ground and south of that to the Shickasheen River.
7. The northeast corner of Worden's Pond, and the swamp near by.
8. Portions of the pond itself and of the eastern shore.

It is difficult to determine the exact distribution of plants in an area

which, like the Great Swamp, is largely at the same level throughout. Thus the one hundred foot contour line marks in general the strictly swampy area, and Worden's Pond, which drains the swamp, is only ninety four feet above sea level, so that there is a dip of less than ten feet from north to south. There are, however, certain features which aid us in the matter. There are at least two important streams which pass through the swamp, the Chipuxet river, and the Shickasheen immediately west of the main railroad. This gives two different types of water areas viz. running and semi-stagnant, which of course merge imperceptibly into one another. A third type includes the two ponds, Worden's and Larkin's, which have a flora different in certain ways from either of the other two types. The temperature of the water was noticeably warmer in the swamp than along the river courses. Certain plants, though included in the swamp area, show a decided tendency to seek the drier portions, such as *Lespedeza frutescens* and *Rhexia Virginica*. The latter of these seemed to grow more luxuriantly, as a rule, in the wetter situations though the individuals were markedly fewer in number than in drier places. On the other hand many plants were decidedly attracted to the free water courses. A few such plants were *Lobelia cardinalis*, *Lycopus Virginicus* and notably *Bidens laevis*. The latter grew so abundantly along the streams of colder water that its dark foliage clearly marked them. The majority of the plants grow between the higher land and the rivers, seeming to prefer the open sunny places. The Droseras are in the less soggy parts and grow oftentimes on the dead *Sphagnum*. *Sarracenia purpurea*, *Xyris caroliniana* and *X. flexuosa* as well as a host of others inhabit these localities.

It is an interesting matter to find that, even in this formation, which is usually supposed to be especially favorable to monocotyledonous plants, aside from *Carex* the number of species is only about a third of the total number of Phanerogams found in the swamp. Hence even in the most favorable locations the Monocotyledons are outnumbered more than two to one. A large part of the swamp is heavily wooded. This is especially true of the area included between the Chipuxet River and the easternmost hill already mentioned. Here the deciduous trees predominate, though there are several groves of evergreens also. *Rhododendron maximum* grows in great luxuriance in this portion of the swamp.

In the following list of plants collected in the Great Swamp during

August, 1906, no name has been admitted if an authentic specimen was found in any of the Rhode Island Herbaria examined. Hence only about half of the plants collected are here recorded. A specimen of each species is in the writer's herbarium, and duplicates of the majority are also in the Brown University Herbarium.

Plants Not Hitherto Recorded in the Great Swamp Flora.

Dryopteris noveboracensis (L.) Gray.
" *simulata* Davenp.
" *spinulosa* (Retz.) Kuntze.
" *Thelypteris* (L.) Gray.
Lycopodium complanatum L.
" *lucidulum* Michx.
" *obscurum* L.
Sparganium americanum Nutt.
Sagittaria Engelmanniana J. G. Smith.
" *latifolia* Willd.
Calamagrostis cinnoides (Muhl.) Scribn.
Glyceria canadensis (Michx.) Trin.
" *obtusa* (Muhl.) Kuntze.
Dulichium arundinaceum (L.) Britton.
Eriophorum virginicum L.
Fimbristylis capillaris (L.) Gray.
Arisaema triphyllum (L.) Torr.
Xyris flexuosa Muhl.
Eriocaulon septangulare L.
Pontederia cordata L.
" " var. *lancifolia* Morong.
Juncus brevicaudatus (Engelm.) Fernald.
Juncus canadensis J. Gay.
" *marginatus* Rostk.
" *pelocarpus* E. Mey.
" *tenuis* Willd. var. *Williamsii* Fernald.
Medeola virginiana L.
Trillium cernuum L.
" *undulatum* Willd.
Hypoxis erecta L.
Cypripedium acaule Ait.
Habenaria blephariglottis (Willd.) Torr.
" *clavellata* (Michx.) Spreng.
" *psycodes* (L.) Gray.
Spiranthes gracilis (Bigel.) Beck.
Goodyera pubescens (Willd.) R. Br.
Myrica asplenifolia L.
Boehmeria cylindrica (L.) Willd.
Polygonum arifolium L.
" *pennsylvanicum* L.
" *Persicaria* L.
" *sagittatum* L.
" *punctatum* Ell.
Lychnis alba Mill.
Spergula arvensis L.
Nymphaea odorata Dryand.
Nuphar advena (Soland.) R. Br.
Coptis trifolia (L.) Salisb.
Drosera intermedia Haynes.
" *rotundifolia* L.
Baptisia tinctoria (L.) R. Br.
Medicago sativa L.
Trifolium hybridum L.
Desmodium canadense DC.
" *ciliare* (Muhl.) DC.
" *paniculatum* (L.) DC.
" *rigidum* DC.
Lespedeza capitata Michx.
" *frutescens* (L.) Britton.
Oxalis corniculata L.
Polygala Nuttallii T. & G.
" *polygama* Walt.
Euphorbia maculata L.
Rhus copallina L.
Hypericum boreale (Britton) Bicknell.
" *canadense* L.
" *gentianoides* (L.) BSP.
" *maculatum* Walt.
" *virginicum* L.
Viola pedata L.
Chamaenerium angustifolium (L.) Scop.

Oenothera biennis L.
Kneiffia pumila (L.) Spach.
Aralia hispida Vent.
Cicuta bulbifera L.
" *maculata* L.
Sium cicutaefolium Gmel.
Cornus Amonum Mill.
Clethra alnifolia L.
Chimaphila umbellata (L.) Nutt.
" *maculata* (L.) Pursh.
Rhododendron nudiflorum (L.) Torr.
Kalmia latifolia L.
Lysimachia quadrifolia L.
Bartonia virginica (L.) BSP.
Asclepias pulchra Ehrh.
Verbena hastata L.
Scutellaria lateriflora L.
Brunella vulgaris L.
Koellia virginiana (L.) Mac M.
Lycopus americanus Muhl.
" *virginicus* L.
Mentha arvensis L.
Ilysanthes attenuata (Muhl.) Small.
" *gratioloides* (L.) Benth.
Gerardia paupercula (Gray) Britton.
" *purpurea* L.
Plantago aristata Michx.
Cephalanthus occidentalis L.
Galium asprellum Michx.
Viburnum cassinoides L.
" *dentatum* L.
Campanula aparinoides Pursh.
Lobelia cardinalis L.
" *inflata* L.
Vernonia noveboracensis (L.) Willd.
Chrysopsis falcata (Pursh) Ell.
Solidago odora Ait.
" *puberula* Nutt.
" *uliginosa* Nutt.
Anaphalis margaritacea (L.) B. & H.
Leontodon autumnale L.
Hieracium Gronovii L.
" *scabrum* Michx.

PROVIDENCE, RHODE ISLAND.

THE RETROGRADE COLOR VARIETIES OF GRATIOLA AUREA.

HARLEY HARRIS BARTLETT.

AT Winter Pond in Winchester, Massachusetts, occurs one of the most typical examples of what Blankinship designates in his "Plant-formations of Eastern Massachusetts" as the "Sand-Pond Margin Formation." Its flora is here unusually well developed, containing in addition to the plants enumerated by Blankinship about twenty others, equally characteristic of the formation. One of these, *Gratiola aurea* Muhl., occupies considerable areas of the low, gravelly shore, frequently to the almost complete exclusion of other plants. It occurs here not only in its typical golden-yellow-flowered form, but also in two well marked color forms the flowers of which are respectively honey-yellow and white.

Two published references to these forms have been found, the earlier of them, in John Robinson's "Flora of Essex County, Massachusetts," to the effect that "There is a white variety of this species which grows in Bowler Swamp, Lynn," the other, in Dame and Collins's "Flora of Middlesex County, Massachusetts," to the effect that "The white variety has been found at Winchester by W. H. Manning; both the white and light yellow varieties at Westfield, by Dr. Swan." In the Gray Herbarium there is a sheet of specimens collected by Dr. Swan in a swamp near Lowell, Mass., on which is written, in Dr. Gray's hand,— "Gratiola aurea vars. Ordinary golden-yellow. Pale yellow! White-flowered! in small quantity."

The two forms, as observed at Winter Pond, are absolutely distinct, without intermediates linking them either to the parent form or to each other. They occur in pure colonies, several of which have been under observation for three years, during which time they have been visited at various dates between July 1st and Sept. 15th, an interval which practically covers the flowering period of the species. Never has the honey-colored form been found in a white colony, nor vice versa, although this might be expected to happen occasionally through the casualties of seed dispersal.

The forms may be named: **Gratiola aurea** f. **helveola** f. nov. a forma typica recedit floribus albogilvis, corollae limbo quam tubo pallidiore. — Type (in Herb. Gray) collected by *Dr. C. W. Swan* at a swamp near Lowell, Mass. **Gratiola aurea** f. **leucantha** f. nov. a forma typica floribus clare albis differt.— Type (in Herb. Gray) *Bartlett 820*, Winter Pond, Winchester, Mass., 7 July 1907.

The significance of these forms (retrograde varieties of de Vries) as throwing light upon the origin of specific distinctions is clear at once when the flower-color of the other American species of § *Gratiolaria* is examined. (The often purple-flowered § *Sophronanthe* may be left out of consideration on the ground of its great habital diversity.) We find: I) Species with golden-yellow flowers,— *G. aurea* Muhl., *G. Torreyi* Small and *G. pusilla* Torr. II) Species with flowers merely yellowish, the limb often white or whitish,— *G. gracilis* Benth., *G. floridana* Nutt., *G. virginiana* L., *G. viscosa* Schwein., *G. Drummondii* Benth. *G. ramosa* Walt. and *G. ebracteata* Benth. III) Species with white flowers,— *G. sphaerocarpa* Ell. and *G.macrantha* Chapm.

F. *helveola* corresponds to the second section in the above grouping, f. *leucantha* to the third. The golden-yellow color of the first group

is the resultant of two yellow elements, by the loss of which, either together or singly, retrogression may take place.

MEETING OF THE JOSSELYN BOTANICAL SOCIETY.—The thirteenth field meeting of the Josselyn Botanical Society of Maine was held at Oxford, Maine, from July 1st to 6th. Owing to various circumstances, there was a very small attendance, but those present found ample material to reward their efforts. The localities of especial interest were the low woods and sandy plains surrounding Whitney Pond, the rocky wooded shores of Thompson Lake, and the extensive arbor-vitae swamps in the town of Norway. The local botanists were very kind in pointing out localities of special interest; Mr. George R. Howe of Norway placing on exhibition his large collection of gems, insects, and other objects of natural history, as well as guiding the party on the trip to the Norway bogs. Mr. W. L. Bacon showed a large collection of the ferns of the region, including many of more than local interest.

A list of all the flowering plants and ferns seen or collected has been kept, and will be published later; the following list, therefore, represents only the plants of unusual interest. On the sand-plain near Whitney Pond large patches of *Lupinus perennis*, L., were found with *Corylus Americana*, Walt. and *Convolvulus spithamaeus* L. This is the first undoubted station for the Lupine in Maine, the record previously depending upon a report in the first edition of the Portland Catalog, (1868). Stations for *Aspidium cristatum clintonianum*, D. C. E., *Habenaria blephariglottis*, Torr., *Medicago denticulata* Willd., and *Erodium cicutarium*, L'Her., were found in Oxford; on the Norway trip, *Cystopteris bulbifera*, Bernh., *Cyprepedium spectabile*, Salisb., *Habenaria hyperborea*, R. Br., and *Arceuthobium pusillum*, Peck. were found in abundance. The Dwarf Mistletoe was also found in a bog in Casco, Cumberland Co., with *Woodwardia Virginica*, Smith, and two plants of *Habenaria macrophylla*, Goldie, were secured in Otisfield.—EDWARD B. CHAMBERLAIN, Cumberland Center, Maine.

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A PARTIAL LIST OF CONNECTICUT DIATOMS WITH SOME ACCOUNT OF THEIR DISTRIBUTION IN CERTAIN PARTS OF THE STATE.

William A. Terry.

Connecticut is rich in diatoms, both in quantity and variety, and fossil deposits are abundant, both of fresh water and marine. The very ancient deposits like those of Virginia and Maryland cannot be expected here, as the great ice sheet during glacial times swept all such as may have existed into the sea, but the time since then has been sufficient for the accumulation of a vast store of material of which very little has ever been investigated. I have found eleven fresh water deposits in Bristol, varying in size from a few rods in diameter to many acres; one in the northern part of the town, "No. 11," covers fifteen acres and possibly much more. The diatomaceous stratum of these deposits is generally three to four feet below the surface, and in the larger deposits averages about two feet in depth, but in No. 11 it is of unknown depth; I have material from ten and a half feet below the surface, showing about seven feet of diatoms to this point; it is especially interesting as it contains numbers of the beautiful *Cyclotella antiqua* W. Sm., which is very rare in this country; all correspondents to whom I have sent it report that they had never seen it before. Dr. Ward sent me a slide with this label from Prof. H. L. Smith's collection which is in his possession, but the forms shown were not the same. The specimens from which Van Heurck made his drawings for his Synopsis must have been very inferior to the Bristol specimens in beauty.

In New Britain Mr. W. R. Stone discovered a fossil deposit in which I found a new *Stauroneis*, the outline of which resembled that of

Navicula amphirhyncus Ehrenb., but exhibited an oblique stauros. This might appropriately have been called *obliqua*, but as Gregory had appropriated this name for an entirely different and much smaller form, I named it *S. nova britannica*, and it was so published in Dr. Bigelow's Observer. Gregory's form was not strictly a *Stauroneis*; it was a very small stauroneiform *Scoliopleura*, and its stauros was not oblique. This New Britain *Stauroneis* is the most rare species of which I have any knowledge; Mr. Stone's original gathering contained some hundreds, perhaps thousands of specimens, but on subsequent investigation no more could be found; they were probably confined to a very thin stratum of the deposit which was not identified, and further exploration is difficult if not impossible as the ground is covered with buildings.

Connecticut waters also are rich in living diatoms, and recent deposits abound. Nearly every lake and pond has its bottom covered with a soft ooze, which is filled with diatoms and is often two or more feet in thickness. The margins of rivers, ditches in the marshes, and the bottoms of small streams and rills in springy mountain pastures, furnish them in abundance. A small stream in a marshy pasture on Fall Mountain in Bristol has an abundant colony of the large variety of *Stauroneis acuta* W. Sm., many times larger than the type of Wm. Smith. I have a slide sent me by Prof. H. L. Smith which he assured me was part of the original gathering from which Tuffen West made the drawing of *S. acuta* for Smith's British Diatomaceae; this is the same as the *Pleurotaenium acutum* of other authors, and is distinctly different from the large Bristol *Stauroneis*. In the colony I find another *Stauroneis* which is quite remarkable; it is longer and more cylindrical than the other species, has a broad stauros and rounded ends with a large saucer-shaped pseudonodule near each end of the upper valve but none on the lower valve. Next to the New Britain *Stauroneis* this is the most rare of all our species of diatoms. They may be gathered in hundreds from a space of about thirty feet on this brook, but they are so much outnumbered by other species with them that it is difficult to find them after they are collected; I have found a single specimen in each of three widely separated ponds in Bristol, but they are known nowhere else. Dr. Ward named this species *Stauroneis Terryi*. In another small stream on Fall Mountain, Mr. W. C. Richards found a colony of *Navicula elliptica* Kütz., notable for abundance and size of individuals.

In five different ponds in Bristol I have found an abundance of a new *Surirella,* and in one of these ponds it is the predominating form. It is about the size of *S. gracilis* A. Schm., but not so alate, and with rounded ends, costa distinct, reaching the median line, which is strongly marked; most specimens have a slight spiral twist. It occurs in two types, one greatly elongated. The living frustules are sometimes covered with coarse granulations that do not come off in the acid treatment, but are removed by the soda. Prof. H. L. Smith wrote me "This *Surirella* is certainly new and much more deserving of a specific name than many others." Dr. Ward named it *Surirella Terryi.* I have found this species abundant in one small pond in New Britain and in one at Leete's Island, but in all other localities known to me it is extremely rare. In Birge's Pond in Bristol are countless numbers of a very peculiar abnormal form of *Surirella.* It is a double frustule in which the two inner valves are grown together with a perforation through the center where the protoplasm of the two cells joins. This opening is sometimes a mere raphe or cleft, more often it is a long narrow slit with smooth edges, but generally it is a large irregular orifice with corrugated sides. This peculiarity is most abundant in *Surirella elegans* Ehrenb., but frequent in *S. cardinalis* Kitton, and occasional, in *S. splendida* (Ehrenb.) Kütz. I found it first in *S. striatula* Turpin in an artificial culture of material from West River, New Haven. Mr. Richards brought me mud from a pond in Wallingford, in which I found it abundant in *S. saxonica* Auersw.; I have seen it in *S. tenera* Greg. and *S. fastuosa* Ehrenb., and have found it in Plymouth and in Derby. An illustrated description was published in Tempère's Micrographe Préparateur.[1]

Nearly every marsh with a level surface covers a deposit of diatoms, and the salt marshes of the Connecticut shore are no exceptions. All of these that I have examined lie above a marine deposit, which generally appears like clay, but always contains diatoms and is sometimes quite rich. The ancient channel of Leete's Island from Great Harbor on the south around to Shell Beach on the north, is one immense mass of marine deposit, in some places fifty feet thick. When the railroad crossing it was changed from a trestle to an embankment, the pressure of the great bank of earth forced out the marine mud

[1] W. A. Terry, Sur un étrange mode de développement chez le genre Surirella. Le Micrographe Préparateur, Vol. XIII, p. 57, 1905.

below it which rose up in great banks on each side of the railroad. All this material contained diatoms, and some of it was very rich, especially in number and rarity of species. I dug up material from about twelve feet below the surface, and found a stratum rich in the beautiful *Surirella Febigerii* Lewis and other rare kinds. One pound of this earth furnished diatoms enough to make several thousand slides, each slide containing thousands of diatoms. The marine deposit in these marshes is sometimes near the surface, and is thrown out in digging ditches, and always in quantities in preparing the foundations for the abutments of bridges. From the earth thrown out in digging a post-hole for a fence on the margin of the marsh near Branford Station I procured a supply of *Campylodiscus echineis* Ehrenb. The Quinnipiac marshes are large, and along their western margin is a series of clay pits from which the tide water is kept out by dikes. The diatomaceous deposit here is of no great thickness but has a very interesting collection of species. At Davis pit the clay is covered by a layer of sand, upon which rests a stratum of alluvium, which contains fresh water diatoms exclusively; these are mostly decayed and broken, those entire being chiefly *Navicula lata* Bréb., with a few of the large *Stauroneis acuta* and *Navicula Semen* Ehrenb. Upon the alluvium is a mass of loam containing the roots and stumps of trees with their trunks and branches beside them, the whole covered with the marine deposit, which extends upward through about four feet of coarse peat.

At many places along the Connecticut shore the ancient marine deposit projects through the bank of sand forming the beach, and is visible at low tide, the huge bank of sand being a superficial structure cast up by the sea and resting upon the ancient deposit. All these salt marshes were once open water, and the sea is now coming back upon them and swallowing up the land. Some of the pond holes in these marshes are deep, with a bottom of soft mud; these are often the remains of former open water, and are always rich in diatoms, frequently very different from those of the neighboring waters. Here is the home of the large *Pleurosigma balticum*, the very large *Amphiprora pulchra* Bail., the larger type of *Surirella striatula*, *Scoliopleura*, *Amphora*, and a variety of rare forms.

In a pond hole of the marshes of Morris Creek I found a new *Pleurosigma*, quite large, in Morris Creek another, not quite so large. On the rocks near the tide gate were masses of *Melosira Borreri* Grev.,

looking in the water like enormous sponges, but collapsing when gathered into a rope of harsh feeling filament, about two feet long, which held great numbers of other diatoms, among them another new *Pleurosigma*, quite small. I sent all three to Tempère, he passed them on to Peragallo, who published illustrated descriptions of them in his monograph [1] which is now the accepted standard for *Pleurosigma*. Peragallo named the largest one *P. Terryanum*, the second *P. Americanum*, and the third *P. paradoxum*. He describes the first as having the outline of *P. strigilis* W. Sm., but the striation of *P. balticum*; the second having the outline of *P. elongatum* W. Sm., but striation of *P. decorum* W. Sm.; and the third was named *P. paradoxum* because the least approximate of its series of striae was the most difficult to resolve. I afterwards found *P. Terryanum* more abundant and larger in a broad ditch at Quinnipiac, and in a pond at Leete's Island. Its natural habitat is in brackish water fed by fresh water springs and too nearly fresh to support *P. balticum*. With this is often found *P. elongatum*, and also the robust type of *Surirella striatula* and a peculiar variety of *Navicula permagna* (Bail.) Ehrenb. The normal type of *N. permagna* is abundant in Oyster River, Woodmont. The species of *Pleurosigma* are found with it at Leete's Island, and also a remarkable colony of *Navicula maculata* Bail., which occurs here in great abundance, and in three distinct types; the largest is extremely rare elsewhere, the second found occasionally along the Connecticut shore, and the third and smallest is the most common. I have it from the New Jersey shore and from Cuxhaven, North Sea. A much smaller variety but with coarser puncta is found in Alabama. The typical *P. Terryanum* is the largest *Pleurosigma* that I find in Connecticut; *P. Americanum* is abundant in tidal creeks; in the marsh on the West Haven side of West River, on the muddy sloping bank of a ditch, I have seen at low tide a brown film about two feet wide and a hundred feet long, which consisted almost entirely of living frustules of *P. Americanum*. *P. paradoxum* is most abundant in Morris Creek, occasional elsewhere. Morris Creek is also the habitat of *Actinocyclus Barkleyi* (Ehrenb.) Grun., which is living here in abundance. I have it also in considerable numbers from the Thames river above Norwich in material sent me by Mr. G. R. Lumsden of Greenville.

[1] Peragallo, Monographie du genre Pleurosigma. Le Diatomiste, Vol. I.

At Branford I find *Ditylum Brightwellii* (West) Grun.; the drawings in books show this with long central spine with abrupt termination, without finish; the Branford specimens have a longer spine terminating in a knob or ball, which indicates that the specimens from which the figures were made were broken. *Nitzschia scalaris* (Ehrenb.) W. Sm. grows abundantly in the brackish water of many of the pond holes of the salt marshes. Pond's Point at Milford is a rounded projection where the southward trend of the shore changes abruptly to west. The beach is composed of large cobblestones and boulders upon a coarse gravel. On its southern margin is visible at low tide a bank of fossil mud, which is firm enough to resist the action of the waves, and is being gradually uncovered as the mass of stones is driven back by storms. A stratum near the upper part of this bank is very rich in diatoms, showing an unusual combination of marine and brackish water forms of more than one hundred species. *Coscinodiscus, Actinoptychus, Triceratium, Amphitetras, Eupodiscus,* with a dozen species of *Pleurosigma* occur, while the abundance of the brackish water form of *Surirella striatula* and *Navicula permagna,* with *Scoliopleura, Amphora, Amphiprora* and *Nitzschia scalaris* (Ehrenb.) W. Sm. show this mud to have once formed the bottom of a pond hole in the marsh; the fresh water spring that fed it still flows over it, and can be seen at low tide. The pressure of the great bank of stones which rested upon it during the time it was being driven over by the sea has crushed to fragments most of the delicate species, but enough remain to show conclusively its character. The marine species mentioned above can be found generally in deep water all along the Connecticut shore, while the different varieties of *Navicula lyra* Ehrenb. and the *Pleurosigmas* are most abundant in shallow water. I have *P. intermedium* W. Sm. abundant in the deep water of Clinton, and the very rare *Navicula Lewisiana* Grev. in shallow water at Bridgeport. *P. balticum* is the most abundant species of the genus, and has many varieties, the largest being found in the salt marshes, the normal type in coves and bays, and the smallest in deep water. *P. affine* Grun. is the most universally distributed being found everywhere along the shore but not generally in great abundance. It is very often mistaken for *P. angulatum* W. Sm., although striation is very different. *P. angulatum* is frequent but local. A ditch in the Quinnipiac marshes through which flows at low tide a strong stream of nearly fresh water is carpeted with a dense growth of *Biddulphia levis* Ehrenb., and near

this is a colony of large and very active *Bacillaria paradoxa* (Gmel.) Grun. Another colony of this species in Morris Creek marsh, although in constant motion, was covered with a parasitic growth of *Leptothrix*, and was accompanied by numerous rapidly revolving filaments of *Spirulina*.

In fresh water the most abundant genus is *Pinnularia* W. Sm.; it is found in quantities almost everywhere. Next to this in numbers is the genus *Stauroneis*, then *Cymbella*, *Surirella*, *Navicula*, and numerous filamentous forms. Although these genera are represented in nearly every pond, yet each pond shows a combination characteristic of itself, and types of the same species vary greatly in the different ponds. In several ponds in Bristol *Surirella elegans* is very large and sometimes much elongated; in Plymouth it is smaller and much shorter in proportion; in Highland Lake, Winsted, beautifully typical specimens of *S. nobilis* W. Sm. are abundant, and in several ponds in Connecticut *Navicula peripunctata* Brun abounds; Prof. Brun founded the species on specimens in mud from Crane Pond, Groveland, Massachusetts, but it is more plentiful in Bristol and in Leete's Island. Van Heurck states that *Achnanthidium flexellum* (Kütz.) Bréb. is rare; it is abundant in two of the Bristol fossil deposits. He also gives *Fragilaria Harrisonii* Grun as very rare; this grows abundantly in Bristol. Dr. Ward found a new diatom in one of my slides from the Connecticut shore, which Cleve named *Caloneis Wardii*. Mr. O. E. Shaffer sent a find of *Nitzschia* to Europe from Port Townsend, Puget Sound, and Cleve named this *N. Shafferi*; I had previously found this nearly twenty years ago at Morris Creek, and reported it at the time in the Amer. Micr. Journal as *N. curvula*. I find *Isthmia nervosa* Kütz. in nearly every deep water sounding from off the Connecticut shore, but do not believe that it grows here; it is probably brought in by ocean currents from warmer waters.

List of Species.

The arrangement of this list is that of De Toni, Sylloge Algarum, and the nomenclature for the most part follows that work. Names given as synonyms are those that have been used by the writer either in published notes or with material distributed. Species marked with a star were founded on Connecticut material.

Navicula nobilis (Ehrenb.) Kütz. Common.

Navicula var. *dactylus* (Ehrenb.) VH. (*N. dactylus* Kütz.) Abundant everywhere.
" *gigas* (Ehrenb.) Kütz. Common.
" *major* Kütz. Abundant everywhere.
" *viridis* (Nitzsch) Kütz. Abundant everywhere.
" *cardinalis* Ehrenb. Frequent, local, Bristol.
" *yarrensis* Grun. Occasional.
" *divergens* (W. Sm.) Ralfs. Frequent, local, Bristol.
" *longa* (Greg.) Ralfs. Frequent.
" *lata* Bréb. Frequent.
" *borealis* (Ehrenb.) Kütz. Frequent, local, Bristol.
" *directa* Ralfs. Occasional.
" *Brebissonii* Kütz. Frequent, local, Bristol.
" *Tabellaria* Kütz. Frequent, local.
" *gibba* (Ehrenb.) Kütz. Frequent, local, Bristol.
" *Legumen* Ehrenb. Occasional.
" *polyonca* Bréb. Frequent.
" *peregrina* (Ehrenb.) Kütz. Common.
" *semen* Ehrenb. Frequent, local, Bristol.
" *zostereti* Grun. Rare, Morris Creek.
" *rhyncocephala* Kütz. Occasional.
" *cancellata* Donk. Frequent, local, Fort Hale.
" *fortis* (Greg.) Grun. Occasional.
" *digito-radiata* (Greg.) Ralfs. Occasional.
" *distans* (W. Sm.) Ralfs. Occasional.
" *brasiliensis* Grun. Frequent.
" *crabro* (Ehrenb.) Kütz. Frequent.
" *interrupta* (Bail.) Kütz. Frequent.
" *didyma* Ehrenb. Common.
" *bombus* (Ehrenb.) Kütz. Occasional.
" *Smithii* Bréb. Frequent.
" *fusca* (Greg.) Ralfs. Frequent.
" *advena* A. Schm. Occasional.
" *elliptica* Kütz. Occasional.
" " var. *oblongella* (Näg.) VH. (*N. oblongella* Näg.) Occasional.
" *lyra* Ehrenb. Locally abundant.
" *pygmaea* Kütz. Local.
" *forcipata* Grev. Occasional, New Haven Harbor.
" *caribaea* Cleve. Occasional, New Haven Harbor.
" *approximata* Grev. Occasional, New Haven Harbor.
" *irrorata* Grev. Occasional.
" *praetexta* Ehrenb. Occasional.
" *Hennedyi* W. Sm. Occasional, Leete's Island.
" *clavata* Greg. Occasional.
" *polysticta* Grev. Occasional, New Haven Harbor.
" *hibernica* O'M. Occasional.

Navicula aspera Ehrenb. Occasional.
" *californica* var. *campeachiana* Grun. Occasional.
" *circumsecta* Grun. Occasional.
" *tuscula* Ehrenb. Rare, local, Bristol.
" *crucicola* (W. Sm.) Donk. Local.
" *palpebralis* Bréb. Occasional.
" *Fischeri* A. Schm. Occasional.
" *arabica* Grun. Occasional.
" *humerosa* Bréb. Frequent.
" *tumescens* Grun. Common.
" *marina* Ralfs. Occasional.
" *pusilla* W. Sm. Local, Quinnipiac.
" *latissima* Greg. Rare.
" *kamorthensis* Grun. Rare, Stony Creek.
" *cuspidata* Kütz. Frequent, local, Bristol.
" *sphaerophora* Kütz. Rare, local, Bristol.
" *serians* (Bréb.) Kütz. Frequent, local, Bristol.
" *formosa* Greg. Frequent.
" *permagna* (Bail.) Edw. Occasional; abundant at Woodmont.
" *elegans* W. Sm. Occasional.
" *limosa* Kütz. Occasional.
" *iridis* Ehrenb. Common.
" " var. *Amphigomphus* (Ehrenb.) VH. (*N. amphigomphus* Ehrenb.) Local.
" " var. *producta* (W. Sm.) VH. (*N. producta* W. Sm.) Occasional.
" " var. *amphirhynchus* (Ehrenb.) De Toni. (*N. amphirhynchus* Ehrenb.) Local.
" *firma* Kütz. Common.
" *Hitchcockii* Ehrenb. Rare, local, Bristol.
" *liber* W. Sm. Occasional.
" *americana* Ehrenb. Rare, local, Bristol.
" *bacillum* Ehrenb. Local.
" *Powellii* Lewis. Occasional.
" *columnaris* Ehrenb. Common.
" *esox* (Ehrenb.) Kütz. Occasional.
" *Sillimanorum* (Ehrenb.) Kütz. Rare, local, Bristol.
" **parallela* Castr. Rare, Bristol.
" *dilatata* Ehrenb. Common.
" *delawarensis* Grun. Local, Quinnipiac.
" *interposita* Lewis. Frequent.
" *amphipleuroides* Grun. Rare.
" *Bartleyana* Grun. Occasional.
" *diploneis* var. *obliquus* Brun. Occasional.
" *maculata* Bail. Occasional; abundant at Leete's Island.
" *peripunctata* Brun. Occasional; abundant in Bristol.

Navicula **theta* Cleve. Local, Quinnipiac.
" **tubulosa* Brun. Occasional.
Caloneis **Wardii* Cleve. Occasional.
Diploneis **didyma* var. *obliqua* Brun. Occasional.
Libellus rhombicus (Greg.) De Toni. (*Navicula rhombica* Greg.)
Rhoiconeis trinodis (W. Sm.) Grev. (*Navicula trinodis* W. Sm.) Rare, Bristol.
Stauroneis phoenicenteron (Nitzsch) Ehrenb. Abundant everywhere.
" *gracilis* W. Sm. Frequent.
" *Gregoryi* Ralfs. Occasional.
" *spicula* Hickie. Rare, Quinnipiac.
" *salina* W. Sm. Common along shore.
" *Stodderi* Lewis. Rare, Bristol.
" **nova britannica* Terry. Rare; only in New Britain.
" **Terryi* Ward. Exceedingly rare; only in Bristol.
Pleurostauron acutum (W. Sm.) Ralfs. (*Stauroneis acuta* W. Sm.) Common.
Pleurosigma angulatum (Quek.) W. Sm. Frequent, local.
" " var. *aestuarii* (Bréb.) VH. Occasional.
" *elongatum* W. Sm. Frequent.
" " var. *gracile* Grun. Occasional.
" *strigosum* W. Sm. Rare, Clinton.
" *naviculaceum* Bréb. Rare.
" *intermedium* W. Sm. Rare, Clinton.
" *nubecula* W. Sm. Rare, Clinton,
" *latum* Cleve. Rare.
" *formosum* W. Sm. Occasional.
" *hypocampus* W. Sm. Frequent, local.
" *decorum* W. Sm. Locally abundant.
" *littorale* W. Sm. Rather rare.
" *balticum* (Ehrenb.) W. Sm. Frequent, local.
" *simile* Grun. Rare, Leete's Island.
" *attenuatum* W. Sm. Frequent, local.
" *Wansbeckii* Donk. Frequent.
" *acuminatum* (Kütz.) Grun. Rather rare.
" *strigile* W. Sm. Occasional.
" *affine* Grun. & Cleve. Common all along the shore.
" **paradoxum* Per. Occasional, Morris Creek.
" *Brebissonii* Grun. & Cleve. Frequent.
" **Terryanum* Per. Local, Quinnipiac, Leete's Island.
" *Spencerii* (Quek.) W. Sm. Frequent, local.
" " var. *curvulum* (Kütz.) Grun. Rare, Quinnipiac.
" *fasciola* W. Sm. Frequent.
" *scalproides* Rab. Rare.
" *eximium* (Thw.) Grun. & Cleve. Occasional.
" **americanum* Per. Abundant, Morris Creek, New Haven.

Pleurosigma subsalinum Per. Rare, Leete's Island, Milford.
Gyrosigma **Temperii* Cleve. Occasional.
Scoliopleura latestriata (Bréb.) Grun. Frequent.
" " *var. *Amphora* Cleve. Rare, Morris Creek.
" *tumida* (Bréb.) Rab. Frequent.
Frustulia rhomboides (Ehrenb.) De Toni. (*Navicula rhomboides* Ehrenb. Frequent.
" " var. *saxonica* (Rab.) De Toni. (*Navicula crassinervia* Bréb.) Occasional.
" *Lewisiana* (Grev.) De Toni. (*Navicula Lewisiana* Grev.) Rare, Bridgeport only.
" *viridula* (Bréb.) De Toni. (*Schizoniema viridulum* Rab.) Rare.
Dickiea crucigera (W. Sm.) De Toni. (*Schizonema crucigerum* W. Sm.) Rare, Quinnipiac.
Brebissonia Boeckii (Kütz.)Grun. (*Navicula Boeckii* Bréb.) Occasional; abundant in Thames River.
Mastogloia **gibbosa* Brun. Occasional.
" *undulata* Grun. Occasional.
Amphiprora lepidoptera Greg. Frequent.
" " var. *pusilla* (Greg.) VH. Frequent.
" *maxima* Greg. Locally abundant.
" *alata* Kütz. Frequent.
" *pulchra* Bail. Locally abundant.
" *conspicua* Grev. Frequent.
" *ornata* Bail. Frequent.
Plagiotropis vitrea (W. Sm.) Grun. (*Amphiprora vitrea* W. Sm.) Frequent.
Tropidoneis **seriata* Cleve. Occasional.
" **zebra* Cleve. Occasional.
Cymbella Ehrenbergii Kütz. Locally abundant.
" *cuspidata* Kütz. Frequent.
" *affinis* Kütz. Local, New Britain.
" *heteropleura* (Ehrenb.) Kütz. Local.
" *gastroides* Kütz. Common everywhere.
" *cymbiformis* var. *parva* (W. Sm.)VH. Local, New Britain.
" *americana* A. Schm. Locally abundant.
" *cistula* var. *maculata* (Kütz.) Grun. Local, New Britain.
Encyonema caespitosum Kütz. Frequent.
" *prostratum* (Bail.) Ralfs. Frequent.
Amphora levis Greg. Frequent.
" *cingulata* Cleve. Frequent.
" *erebi* Ehrenb. (*A. cymbifera* Greg.) Frequent.
" *Clevei* A. Schm. Frequent.
" *intersecta* A. Schm. Frequent.
" *Eulensteinii* Grun. Frequent; locally abundant at Milford.
" *proteus* Greg. Frequent.

Amphora obtusa Greg. Frequent.
" *ovalis* (Bréb.) Kütz. Frequent.
Gomphonema acuminatum Ehrenb. Common.
" *constrictum* Ehrenb. Common.
" *capitatum* Ehrenb. Common.
" *geminatum* (Lyng.) Ehrenb. Common.
" *augur* Ehrenb. (*G. cristatum* Ralfs.) Common.
Rhoicosphaenia curvata (Kütz.) Grun.
Cocconeis scutellum Ehrenb. Frequent.
" *dirupta* Greg. Frequent.
Achnanthes longipes Ag. Common.
" *brevipes* Ag. Common.
" *subsessilis* Kütz. Fort Hale.
" **curvirostrum* Brun. Very rare, Morris Cove.
" **manifera* Brun. Very rare, Morris Cove.
Achnanthidium flexellum (Kütz.) Bréb. Rare; abundant in Bristol, fossil.
Bacillaria paradoxa (Gmel.) Grev. Occasional near New Haven.
Nitzschia granulata Grun. Occasional.
" *tryblionella* Hantzsch. Frequent.
" " var. *maxima* Grun. Occasional.
" *plana* W. Sm., Occasional.
" *marginulata* Grun. Occasional.
" *acuminata* (W. Sm.) Grun. Occasional.
" *circumsuta* (Bail.) Grun. Frequent.
" *scalaris* (Ehrenb.) W. Sm. Abundant.
" *angularis* W. Sm. Frequent.
" *sigmoidea* (Nitzsch) W. Sm. Frequent, locally abundant.
" *sigma* (Kütz.) W. Sm. Common.
" *fasciculata* Grun. Common.
" *obtusa* W. Sm. Occasional.
" *linearis* var. *tenuis* (W. Sm.) Grun. (*N. tenuis* W. Sm.) Rare, Leete's Island.
" *curvirostris* var. *Closterium* (Ehrenb.) VH. (*N. Closterium* W. Sm.) Rare, West Haven.
" *Lorenziana* Grun. Rare.
" *Shafferi* Cleve. (*N. curvula* Terry, not W. Sm.) Very rare, Morris Cove.
Hantzschia amphioxys (Ehrenb.) Grun. Abundant in Bristol.
" **segmentalis* Brun. Rare, Morris Cove.
Surirella biseriata (Ehrenb.) Bréb. Common.
" *linearis* W. Sm. Frequent.
" *robusta* Ehrenb. Frequent in Winsted.
" *splendida* (Ehrenb.) Kütz. Common.
" *tenera* Greg. Common.
" *elegans* Ehrenb. Common.
" " var. *norvegica* (Eulen.) Brun. Occasional, Bristol.

Surirella striatula Turp. Frequent, locally abundant.
" " " var. *triplicata* Grun. Occasional.
" *gemma* Ehrenb. Frequent.
" *cardinalis* Kitt. Rather rare; abundant in Bristol.
" *ovalis* Bréb. Occasional.
" " var. *angusta* (Kütz.)VH. (*S. angusta* Kütz.) Occasional.
" *fastuosa* Ehrenb. Frequent.
" " var. *lata* (W. Sm.) VH. Frequent.
" *recedens* A. Schm. Occasional.
" *Moelleriana* Grun. Occasional.
" *gracilis* A. Schm. Occasional.
" *Febigerii* Lewis. Frequent.
" *constricta* Ehrenb. Rare, Killingsworth.
" **Terryi* Ward. Rare, except in Bristol, New Britain and Leete's Island.
Cymatopleura elliptica (Bréb.) W. Sm. Rare, New Britain.
" *solea* (Bréb.) W. Sm. Occasional.
" *hibernica* W. Sm. Rare.
" *marina* Lewis. Rare, Clinton.
Podocystis adriatica Kütz. (*P. americana* Bail.) Rare.
Campylodiscus echineis Ehrenb. Common.
" *hibernicus* Ehrenb. Frequent.
Diatoma vulgare Bory. Frequent.
" *elongatum* var. *tenue* (Ag.) VH. (*D. tenue* Ag.) Frequent.
" *hiemale* (Lyngb.) Heib. (*Odontidium hiemale* Kütz.) Locally abundant.
" *anceps* (Ehrenb.) Kirchn. Frequent.
Odontidium mutabile W. Sm. Locally abundant.
" *Harrisonii* W. Sm. (*Fragilaria Harrisonii* Grun.) Rare and local, Bristol.
Meridion circulare (Grev.) Ag. Frequent.
" *intermedium* H. L. Sm. Frequent.
Synedra pulchella (Ralfs) Kütz. Occasional.
" " var. *Smithii* (Ralfs) VH. Occasional.
" *ulna* var. *danica* (Kütz.) VH. (*S. danica* Kütz.) Frequent.
" *affinis* Kütz. Frequent.
Ardissonia superba (Kütz.) Grun. (*Synedra superba* Kütz.) Occasional, Leete's Island.
Asterionella formosa Hass. Abundant in water supply.
" *Ralfsii* W. Sm. Abundant in water supply.
Fragilaria virescens Ralfs. Common.
" *capucina* Desmaz. Common.
" *construens* (Ehrenb.) Grun. Common.
Raphoneis amphiceros Ehrenb. Frequent.
" *belgica* Grun. Rare, Leete's Island.
" " var. *intermedia* Grun. Occasional.
" *gemmifera* Ehrenb. Frequent.

Dimerogramma minus (Greg.) Ralfs.
" *Surirella* (Ehrenb.) Grun. (*Raphoneis Surirella* Grev.) Occasional.
Plagiogramma staurophorum (Greg.) Heib. (*P. Gregorianum* Grev.) Occasional, Quinnipiac.
" *validum* Grev. Occasional, Leete's Island.
Licmophora flabellata (Carm.) Ag. Frequent.
" *Juergensii* Ag. Frequent.
" *tincta* (Ag.) Grun. Frequent.
Tabellaria fenestrata (Lyngb.) Kütz. Common.
" *flocculosa* (Roth) Kütz. Common.
Grammatophora oceanica var. *macilenta* (W. Sm.) Grun.
Rhabdonema arcuatum (Lyngb.) Kütz. Occasional.
" *adriaticum* Kütz. Common.
Epithemia turgida (Ehrenb.) Kütz. Frequent.
" *gibba* (Ehrenb.) Kütz. Occasional.
" " var. *ventricosa* (Ehrenb.) Grun. Frequent.
" *argus* (Ehrenb.) Kütz. Frequent.
" *zebra* (Ehrenb.) Kütz. Frequent.
" *musculus* Kütz. Frequent.
Eunotia major (W. Sm.) Rab. Frequent.
" *praerupta* Ehrenb. Frequent.
" " var. *bidens* Grun. Frequent.
" *gracilis* (Ehrenb.) Rab. Frequent.
" *robusta* Ralfs, including *E. Diadema* Ralfs. Frequent.
" *elongata* Rab. Frequent.
Pseudoeunotia lunaris (Ehrenb.) Grun. (*Eunotia lunaris* Grun.) Locally abundant.
" *flexuosa* (Bréb.) Grun. (*Eunotia flexuosa* Bréb.) Locally abundant.
" *flexuosa* var. *bicapitata* Grun. Locally abundant.
Actinella punctata Lewis. Common.
Rhizosolenia styliformis Brightw. Leete's Island.
Isthmia nervosa Kütz. Frequent.
Hemiaulus affinis Grun. South Haven.
" *tubulosus* Brun. Occasional.
Odontella aurita (Lyng.) Ag. (*Biddulphia aurita* Bréb.) Frequent.
" *turgida* (W. Sm.) VH. Frequent.
Biddulphia pulchella Gray. Frequent.
" *Tuomeyi* (Bail.) Roper. Occasional.
Denticella mobiliensis (Bail.) Grev. (*Biddulphia Baileyi* W. Sm.) Rare.
" *rhombus* Ehrenb. (*Biddulphia rhombus* W. Sm.) Frequent.
Eunotogramma laeve Grun. Occasional.
Terpsinoe musica Ehrenb. Occasional.
" *americana* (Bail.) Ralfs. Occasional.

Amphitetras antediluvianus Ehrenb. Frequent.
Triceratium alternans Bail. Occasional.
" *flavum* Ehrenb. Frequent.
Lithodesmium undulatum Ehrenb. Leete's Island.
Syndendrium diadema Ehrenb. Occasional.
Periptera tetracladia Ehrenb. Occasional.
Pyxilla baltica Grun. Frequent; locally abundant, Leete's Island.
Ditylium Brightwellii (West) Grun. including *D. inaequale* Bail., *D. tetragonum* Bail., and *D. trigonum* Bail. Very rare, Branford only.
" *intricatum* (West) Grun. Very rare, Branford.
Auliscus pruinosus Bail. Frequent.
" *sculptus* (W. Sm.) Ralfs. Common.
" *caelatus* Bail. Occasional.
" *Macraëanus* Grev. Occasional.
Pseudoauliscus radiatus (Bail.) Rattray. Rare, Leete's Island.
Cerataulus levis (Ehrenb.) Ralfs. (*C. polymorphus* VH. *Biddulphia levis* Ehrenb.) Frequent.
Eupodiscus Rodgersii Ehrenb. Rare, Leete's Island.
" *argus* Ehrenb. Frequent.
Stephanopyxis turris (Grev.) Ralfs. Occasional, New Haven.
" " var. *intermedia* Grun. (*S. appendiculata* var. *intermedia* Grun.) Occasional.
" *ferox* (Grev.) Ralfs. Occasional, Milford.
" *corona* (Ehrenb.) Grun. Occasional.
Stephanodiscus niagarae Ehrenb. Rare.
Actinocyclus crassus VH. Frequent.
" *Ralfsii* (W. Sm.) Ralfs. Frequent.
" *Barkleyi* (Ehrenb.) Grun. Abundant, Morris Cove.
" *Ehrenbergii* Ralfs. Frequent.
" *tenuissimus* Cleve. Rare, Morris Cove.
" *subtilis* (Greg.) Ralfs. Rare, Morris Cove.
" *triradiatus* Roper. Rare, Leete's Island.
Coscinodiscus excentricus Ehrenb. Frequent.
" *nitidus* Greg. Frequent.
" *symbolophorus* Grun. Occasional.
" *subtilis* Ehrenb. Rare, local.
" *marginatus* Ehrenb. Occasional.
" *radiatus* Ehrenb. Frequent.
" *concinnus* W. Sm. Frequent.
" *gigas* Ehrenb. Rare, Leete's Island.
" *asteromphalus* Ehrenb. Frequent.
" *oculus-iridis* Ehrenb. Frequent.
" *apiculatus* Ehrenb. Frequent.
Lysigonium moniliforme (Mull.) Link. (*Melosira Borreri* Grev.) Locally abundant.
" *varians* (Ag.) De Toni. (*Melosira varians* Ag.) Abundant.

Gallionella nummuloides (Dillw.) Bory. (*Melosira nummuloides* Ag.) Frequent.
Melosira undulata (Ehrenb.) Kütz. Frequent.
" *sculpta* (Ehrenb.) Kütz. Common.
" *coronata* Grun. New Haven.
" *octogona* Grun. Frequent.
Paralia sulcata (Ehrenb.) Cleve. Rare, Leete's Island.
Cyclotella antiqua W. Sm. Very rare, Bristol only.
" *striata* (Kütz.) Grun. Silver Sands.
" *Kuetzingiana* Thw. Frequent.
Podosira dubia (Kütz.) Grun. Occasional.
Hyalodiscus subtilis Bail. Occasional.
" *stelliger* Bail. Occasional.
Actinoptychus undulatus (Bail.) Ralfs. Common.
" *velatus* Ehrenb. Occasional.

BRISTOL, CONNECTICUT.

THE GENUS SUAEDA IN NORTHEASTERN AMERICA.

M. L. FERNALD.

THE genus *Suaeda* has long been for the American botanist a source of much confusion and difficulty, in part because it consists of unattractive plants of saline soils which are generally ignored by collectors, in part because of the very indefinite conception of the true *Suaeda maritima* of Europe — the species about which our studies, at least of the eastern coast forms, must largely center. It has long been known to many New England botanists that we have on our northeastern coast more than the single species alloted to this region in Gray's Manual; and the two species described and figured (as *Dondia*) in Britton & Brown's Illustrated Flora satisfactorily cover only the forms which occur on the salt marshes and sea beaches from southern New England southward. On the coast of Maine are other forms which in habit, flowering-season, and fruit-characters are unlike the plants of the more southern shores.

During the summer of 1898 Mr. J. C. Parlin and the writer spent a day (July 23) upon Wells Beach and the adjacent marshes in southern Maine. At that time a small depressed *Suaeda* (no. 1) with short subcylindric dark green leaves was in mature fruit. Another depressed

and very slender plant (no. 2) with longer semicylindric very glaucous foliage was in flower and with occasional mature seeds. A third but scarce plant (no. 3), then beginning to fruit, had much coarser purple-tinged ascending and slightly branching stems, and the leaves only slightly glaucous. Two other species not then in flower were common — one an erect or ascending profusely branched green plant (no. 4) a foot or two high, the elongate-linear leaves not glaucous; the other a depressed plant (no. 5), at that time showing no trace of flowering, generally with the coarse stems and slender leaves purplish. Late in the following September additional collections and field notes were made about Wells Beach by Miss Kate Furbish. The two slender depressed plants (nos. 1 & 2) which had been in fruit nearly two months earlier were, at the time of these later observations, over-ripe or quite shrivelled, and the tall erect very branching plant (no. 4) was in mature condition, but the coarse decumbent plant (no. 5) with its green or generally claret-colored stems and leaves was barely in fruit. Its habit, however, and the very dense elongate-spicate inflorescences distinguished it superficially from the other plants near which it grew. An exhaustive study of the Suaedas of eastern Massachusetts recently made by Mr. Wm. P. Rich has shown that two forms — the tall late-fruiting species (no. 4) and the ascending plant (no. 3) noted as scarce on Wells Beach — are generally distributed along the Massachusetts coast, while a third plant, the slender depressed very glaucous form (no. 2) occurs on the North Shore.

A detailed examination of these five plants shows that besides their marked habital characters and their different fruiting seasons, at least four of them possess good differential characters in their calyces and seeds. These five New England plants divide themselves naturally into two groups — the first, with the sepals thickened and strongly carinate upon the back, including the two late-flowering plants (nos. 4 & 5); the second group, with the sepals thinner and rounded or very slightly carinate upon the back, including the three plants (nos. 1, 2, and 3) found fruiting in late July. The former group includes the plants now generally passing as *Suaeda linearis* (Ell.) Moq. (*Dondia Americana* Britton in part); and the three plants with the sepals more rounded on the back are included under *Suaeda maritima* (L.) Dum. (*Dondia maritima* Druce).

In order to make a satisfactory disposition of these forms it is necessary first to gain a clear conception of the European *Suaeda*

maritima. This unfortunately is not easily accomplished. The specimens distributed as this species from European herbaria are very different from one another, and, like the American plant, they are probably a confusion of several distinct things. The descriptions too are confusing. When one refers, however, to the original description of the Linnaean *Chenopodium maritimum*, upon which *Suaeda maritima* was founded he finds an indication that the name belongs to the plant which of late has been so called in America. At least, judging from an excellent photograph secured by Dr. B. L. Robinson of the specimen preserved at the British Museum, the plant first cited by Linnaeus (the Hortus Cliffortianus specimen) is our bushy-branched plant with large calyces and the achenes 2 mm. broad. The maturer specimens in the Linnaean Herbarium, as photographed by Dr. Robinson, seem also to be like the plant of Hortus Cliffortianus. This species is fortunately the plant represented in the plates cited by Moquin in his description of *Chenopodina maritima a vulgaris* in DeCandolle's Prodromus. These plates are two [1] and they represent a plant well known in our herbaria both from Europe and America. In habit, color, calyx and seed it is closely matched by the third form mentioned from Wells Beach, and found very generally on the Atlantic coast of America.

Our conception of *Suaeda linearis* (Ell.) Moq. has also been very confused. From his description Elliott's *Salsola linearis* is apparently a tall erect freely branching plant (no. 4) which is common on the Atlantic coast from southern Maine to Texas. Elliott cited, however, as synonyms two plants — *Salsola salsa*? Michaux and *Chenopodium maritimum* Walter — neither of which seems clearly identified with the "nearly erect....much branched" plant which he described. The erect bushy plant with the flowers "spiked" and with the sepals "angled on the back," as described by Elliott, has small seeds, rarely 1.5 mm. broad. The portion of Walter's specimen of *Chenopodium maritimum* preserved in the Gray Herbarium shows a plant apparently not distinguishable from the common *Suaeda maritima* of Europe and our northeastern coast. The fragment has the large flowers subtended by leaves which are much longer than in the commoner tall southern plant with its "spiked" flowers, the larger sepals are not distinctly carinate, and the large seed (2 mm. broad) is not different

[1] Oeder, Fl. Dan. iii. t. 489 (1770); Sm. Engl. Bot. t. 633 (1799).

from that of the European *Chenopodium maritimum*. Moquin in his monograph of the *Chenopodiaceae* transferred the tall plant to *Suaeda*, as *S. linearis*, following very closely Elliott's description. In DeCandolle's Prodromus, however, he states that the seeds are a line long,— the size of those in Walter's plant and in the common *S. maritima*, but much larger than in the common southern plant which closely matches Elliott's and Moquin's original descriptions. This large-seeded plant, with the leaves of the flowering branches usually elongated and with thin rounded sepals was accepted by Dr. Watson in his early studies of the group as true *Suaeda linearis* Moq. (*Salsola linearis* Ell.), and the small-seeded plant with carinate sepals, described by Elliott was treated as a variety of the species, var. *ramosa*, though later, in the 6th edition of Gray's Manual, he considered the common erect plant with small seed true *S. linearis*.

Under his *Suaeda linearis*, var. *ramosa*, Dr. Watson apparently without hesitation included as a synonym *Salsola salsa* Michaux, from the mouth of the St. Lawrence, a plant which had been included with hesitation by Moquin and others under *Suaeda linearis*. From the original Michaux material it is impossible to determine with certainty the exact identity of that plant; but that it is the same as the erect branching small-seeded *Suaeda linearis* (var. *ramosa* Wats.) of the southern coast is open to serious doubt. So far as exploration on the Maine coast and the lower St. Lawrence has shown, the tall small-seeded *S. linearis* rarely occurs east of the mouth of the Kennebec, nor has it been collected in the maritime provinces of Canada. In fact, north of Cape Anne the three species (excepting the local *S. linearis* of southern Maine) which we know are low plants of procumbent or at least wide-spreading or loosely branching habit. Michaux supposed the lower St. Lawrence plant to be the European *Salsola salsa*, and his primary descripion might well be that of the Old World plant; but in the accompanying observation he states that his American specimen differs from the European in its more slender subdecumbent habit and more crowded flowers.[1] The Michaux plant was soon distinguished by Persoon from the erect *Salsola salsa* as a variety, "*β*? *americana*, humilior, subdecumbens, flor. confertioribus."[2]

[1] "A. Salsola quæ maritima circa *Hâvre de Grace* et *Dieppe* incolit, in eo tantum differt, quod humilior sit et subdecumbens, floribus confertioribus."— Michx. Fl. i. 174 (1803).

[2] Pers. Syn. i. 296 (1805).

Subsequently the Michaux plant, as already stated, has been doubtfully placed by Moquin and others under the more southern *Suaeda linearis*, and by Dr. Watson it was included as a synonym under his tall erect but later discarded var. *ramosa*. And more recently, in the Illustrated Flora, Dr. Britton has taken up for the well-known Atlantic coast plant with "stem erect, strict, 1°–3° tall," the name used by Persoon to designate a "low subdecumbent" plant; and regarding Michaux's subdecumbent plant from the lower St. Lawrence as identical with the more southern erect species, he makes the new combination *Dondia Americana* (Pers.) Britton.

In the summer of 1903 the writer examined the Michaux type and at that time made the note: "Loosely branching *Suaeda*, very immature, but from the crowding of the flowers seems to be the same as the Norwood Cove and Wells Beach species of late September and October." This plant of Norwood Cove and Wells Beach (no. 5 of the preceding notes) is well characterized not only by its late fruiting and subprostrate habit but by its densely crowded flowers on spiciform branches, its very irregular calyx, and its rich claret-color in autumn; and it is apparently the plant intended by Persoon as *Salsola salsa*, var. *americana*.

The northeastern maritime Suaedas as understood by the writer may be classified as follows —

* Seed 2 mm. broad.

SUAEDA MARITIMA (L.)Dumort. Comparatively low, 0.5–4 (rarely 5 or 6) dm. high, ascending or depressed, subsimple or with spreading-ascending or decumbent subsimple branches, often even forming depressed mats 5 dm. or less in diameter: leaves usually more or less glaucous, linear, acute or obtusish, semicylindric, flat above, convex beneath, 5 cm. or less long; those of the flowering branches slightly shorter than the others and much exceeding the 1–4 axillary flowers: sepals pale-green, rounded or obscurely keeled on the back: seed red-brown or black.— Fl. Belg. 22 (1827); Moq. Ann. Sci. Nat. xxiii. 308 (1831), and Chenop. Enum. 127 (1840). *S. maritima a vulgaris* Moq. Chenop. Enum. 128 (1840). *S. linearis* Watson, Proc. Am. Acad. ix. 87 (1874) in part; Wats. & Coult. in Gray, Man. ed. 6, 435 (1890) in part; not Moq. *Chenopodium maritimum* L. Sp. 221 (1753); Oeder, Fl. Dan. iii. t. 489 (1770); Walter, Fl. Car. 111 (1788); Sm. Engl. Bot. ix. t. 633 (1799). *Atriplex maritima* Crantz, Inst. i. 208 (1766). *Salsola maritima* Poir. Encyc. vii. 291 (1806). *Schoberia maritima* C. A. Meyer in Ledeb. Fl. Alt. i. 400 (1829). *Cheno-*

podina maritima Moq. in DC. Prodr. xiii. pt. 2, 161 (1849). *C. maritima, a vulgaris* Moq. l. c. *Dondia maritima* Druce, Ann. Scot. Nat. Hist. (1896) 42; Britton & Brown, Ill. Fl. i. 585, t. 1394 (1896).— Common on wet marshes along the coast from Anticosti to Connecticut, and occasionally southward to Louisiana. Eurasia.

Walter's specimen of his *Chenopodium maritimum* from the Carolina coast is not readily distinguished from this, though his description is cited by Elliott under *Salsola linearis*. On the Massachusetts coast and southward the ascending bushy form of the plant prevails, but from Ipswich northward along the coast of Maine and Eastern Canada it often gives way to a more depressed and usually more glaucous plant, which, however, cannot be clearly separated from the other form. Apparently the same forms in the British Isles have a distribution parallel with this, for, according to Syme "the erect variety is more common in the south, the procumbent in the north; but it is scarcely possible to draw any line of demarcation between them" (Engl. Bot. ed. 3, viii. 4.).

*** * Seed 1.25 to 1.5 mm. broad.**

+— Sepals rounded on the back, not carinate.

S. Richii. Stems procumbent, forming mats 5 dm. or less across (often fruiting when only 1 cm. or so long): leaves dark green, not at all glaucous, linear to linear-oblong, bluntish, subcylindric, dorsally compressed, the lower 1.5 cm. or less in length; those subtending the fascicles of flowers broader and shorter (4 or 5 mm. long): seed black. — Common on salt marshes and in damp spots at the edge of the beach, Wells, Maine, Aug., 1892 (*Anne E. Perkins*), Sept. 16, 1895 (*Walter Deane*), July 23, 1898, TYPE (*J. C. Parlin & M. L. Fernald*), Sept. 1898 (*Kate Furbish*); also on Great Cranberry Isle, Maine, Aug. 30, 1892 (*E. L. Rand*), and at Cutler, Maine, Aug. 27, 1902 (*M. L. Fernald*). A very distinct species, in its procumbent habit suggesting the depressed form of *S. maritima*, but, in the field, quickly distinguished by its short blunt dark (not glaucous) green foliage, as well as its small seed. From the other small-seeded species, *S. linearis*, it is distinguished by its procumbent habit and short blunt leaves, as well as by the rounded (not carinate) sepals. Unlike any other American plant, this Suaeda in habit strongly suggests *S. microsperma* (C. A. Meyer) Fenzl, but that Asiatic plant has much smaller seeds, and the sepals cucullate-carinate.

This procumbent small-seeded plant of the Maine coast is named for William Penn Rich, a discriminating student of salt marsh vegetation, who in April, 1898, pointed out in the herbarium of Mr. Walter Deane the peculiarities of the species here described.

+— +— Sepals (or some of them) carinate on the back.

++ Stems procumbent: 1 or 2 sepals more cucullate-carinate than the others.

S. americana (Pers.) n. comb. Stems procumbent, the branches 2 or 3 dm. long, only the abundant flowering ones ascending: lower leaves linear, acute, about 2 cm. long; those of the densely-flowered ultimate branches broader and much shorter: one or two sepals usually much more cucullate-carinate than the others: entire plant generally becoming, in the autumn, a rich crimson-lake or claret-color. — *Salsola salsa*? Michx. Fl. i. 174 (1803), not L. *S. salsa*, *β.*? *americana* Pers. Syn. i. 296 (1805). *Dondia americana* Britton in Britton & Brown, Ill. Fl. i. 584, merely as to name-bearing synonym (1896).— Salt marshes, maturing from late September to November. Known only from the original Michaux material from the lower St. Lawrence, and from two stations on the coast of Maine,— Norwood Cove, Southwest Harbor, September 18, 1892 (*M. L. Fernald*) and Wells Beach, late September, 1898 (*Kate Furbish*); but in its very procumbent habit, dense subspicate inflorescence, and generally irregular calyx, apparently a very distinct species.

++ ++ Stems erect or ascending: sepals equally carinate.

S. LINEARIS (Ell.) Moq. Erect or ascending, 2 to 9 dm. high, profusely branched; the slender branches ascending or sometimes wide-spread, but not procumbent: leaves narrowly linear, dark green (not glaucous), 4 cm. or less long, those of the slender elongated flowering branches much shorter: sepals equally carinate.— Chenop. Enum. 130 (1840); Wats. Proc. Am. Acad. ix. 87 (1874), at least in part; Wats. & Coult. in Gray, Man. ed. 6, 435 (1890), in part ; Chapm. Fl. ed. 3, 406 (1897). *S. linearis*, var. *ramosa* Wats. l. c. (1874), excluding syn. *Salsola salsa* Michx. & *S. salsa*, var. *americana* Pers. *S. maritima* Torr. (*Sueda*) Fl. N. Y. ii. 141 (1843); Gray, Man. 377 (1848); not Dumort. *Chenopodium maritimum* Pursh, Fl. 198 (1814), not *L. Salsola linearis* Ell. Sk. i. 332 (1817). *Chenopodina linearis* Moq. in DC. Prodr. xiii. pt. 2. 164 (1849). *C. maritima* Gray, Man. ed. 2, 366 (1856); Chapm. Fl. 378 (1860); not Moq. *Dondia Americana* Britton in Britt. & Brown, Ill. Fl. i. 584, t. 1393 (1896), excluding syn. *Salsola salsa*, var. *americana* Pers.— On the seacoast, chiefly in dryish sand or at the borders of marshes, from Maine to Texas; rare east of the Kennebec.

GRAY HERBARIUM.

FLOWER COLOR OF THE AMERICAN DIERVILLAS.—The change in flower color which follows pollination in the Asiatic species of *Diervilla* § *Weigela* is often cited as a striking case of adaptation to pollination by bees. In all but one of the Weigelas the flowers are at first white or merely roseate-tinged, but after pollination they change quickly to deep rose or carmine, in which condition they remain fresh for some length of time, serving to attract bees to the shrub. Only the white flowers are visited for honey, however. Among the American species of *Diervilla*, which belong to a section of the genus distinguished from § *Weigela* by the smaller yellow flowers, the corresponding phenomenon seems to have been recorded only by Mrs. Dana. In "How to know the Wild Flowers" she says of *Diervilla Lonicera* Mill. (*D. trifida* Moench): "The lower lobe of the corolla is crested and more deeply colored than the others, thus advising the bee of secreted treasure. ....When the blossom has been despoiled and at the same time fertilized, for the nectar-seeking bee has probably deposited some pollen upon its pistil, the color of the corolla changes from a pale to a deep yellow...." Other observers have noticed that the flower of this species is not always "light yellow" or "honey yellow," but have apparently ascribed the differences to specific variability.

In shady woods the change in *Diervilla Lonicera* is not very noticeable, but in dry localities where the growth of the shrub is stunted, as for example on Mt. Chocorua, N. H., and on the summit of Great Blue Hill, near Boston, the flowers become deep scarlet. The lip is the first part to show signs of change and it remains always of a deeper hue than the rest of the corolla, becoming, on Blue Hill, almost maroon. At the Arnold Arboretum, where all the American Diervillas are cultivated under moderate conditions of shade and moisture, fresh flowers were compared with Ridgway's standard color scale and the following changes noted. In *D. Lonicera* Mill. the corolla is at first citron yellow. The lip changes to poppy red and the other lobes to scarlet. In *D. rivularis* Gattinger the change is from yellow to a lightly suffused, dull poppy red, most intense on the lip. In *D. sessilifolia* Buckley the citron yellow corolla changes to cadmium yellow except on the lip, which becomes orange. *D. splendens* Carrière, which Mr. Rehder is inclined to consider a hybrid between *D. Lonicera* and *D. sessilifolia*, changes from canary yellow to pale orange, with an orange lip. In this character, as well as in its time

of flowering, it resembles the latter of its supposed parents.— H. H. BARTLETT, Gray Herbarium.

MACLURA POMIFERA (RAF.) SCHNEIDER.— In the May issue of RHODORA (ix. 91) I noted the fact that the Osage Orange, a common hedge plant of the Middle West and an occasional escape from cultivation in New England, should according to the Vienna Rules of nomenclature bear the name *Maclura pomifera*. I was not aware at the time that this particular combination had been used in print. Through the kindness of Mr. Alfred Rehder of the Arnold Arboretum I learn that the binomial *Maclura pomifera* was published about a year earlier in a short supplement of the first volume of C. K. Schneider's detailed Illustriertes Handbuch der Lauholzkunde (i. 806).— B. L. ROBINSON, Gray Herbarium.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.— NEW SERIES, NO. XXXV.

THE SOIL PREFERENCES OF CERTAIN ALPINE AND SUBALPINE PLANTS.

M. L. Fernald.

The floras of alpine and subalpine districts are especially attractive to the field-botanist. The flowers of such regions are as a rule more showy in proportion to the size of the plants than in the lowland forms; while on mountain summits and slopes are found many species quite unknown in the habitable districts. And, owing to the steepness and exposure of the slopes, the plants of alpine and subalpine situations are ordinarily found in picturesque and even inaccessible localities:— on the faces of cliffs, in rock-crevices, or on talus-slopes formed from the overhanging cliffs. In this characteristic, of growing primarily on soils derived from the rock in place, our alpine plants are strongly contrasted with the most familiar vegetation of the lower and more habitable regions of New England, New York, and eastern Canada, a vegetation which is found on more or less mixed or transported soils — in our region chiefly of alluvial or glacial origin.

Aside from the somewhat unique habitat of many plants of high mountains and cliffs and their interest as species unknown or rarely seen in the lowland, these alpine plants present to the student of geographic botany a problem of peculiar fascination. In most cases their known distribution is seemingly very erratic. The typical plants of these regions, instead of occurring over broad and continuous areas of eastern Canada and the United States, are found in only a few very isolated situations; and not until they reach the high-northern districts of polar America or other boreal regions do they occur extensively or in closely contiguous large areas. *Empetrum nigrum*, for instance, the Crow-berry or Curlew-berry, is a characteristic trailing

shrub at the very highest points of the Adirondack, Green, and White Mountains, on the naked-topped mountains of Maine, on Mt. Albert and Table-top Mt. in Gaspé, on the rocks of Mt. Desert Island and the adjacent coast of Maine, New Brunswick and Nova Scotia; thence along the coast of Nova Scotia and the outer coast of Newfoundland to Labrador. About the Gulf of St. Lawrence it is somewhat local and usually confined to cold bogs or occasional cliffs. In other words, south of the St. Lawrence *Empetrum nigrum* is isolated in its distribution, occurring only on the higher mountain-summits and on cold coastal rocks or bogs. North of the St. Lawrence, however, it becomes one of the commonest of plants, "abundant throughout the semi-barren and barren regions of the [Labrador] peninsula, growing freely on the coast and inland,"[1] and according to Delabarre it is "the most abundant phenogamous plant of Labrador."[2] West of the Labrador Peninsula and Baffin Land it grows, according to Macoun, "along the north shore of Lake Superior, and at Port Arthur, ... Thence it takes a northwesterly direction and is found in peat bogs, on exposed rocks along the shores, and on barren grounds to the Pacific Ocean and Arctic Sea."[3] From the Arctic it extends southward along the Coast Range to the region of Sitka, and very locally on cliffs to the coast of northern California. It is also on the mountains of southern British Columbia, and locally in Washington; and it grows in arctic-alpine regions of Eurasia. *Rubus Chamaemorus*, the Baked-apple of the coastal region of eastern Maine, southern New Brunswick and Nova Scotia, is also on the higher White Mts. of New Hampshire and the adjacent high peaks of western Maine, but unknown on other New England mountains; locally on bogs of Temiscouata and Rimouski Counties, Quebec, and on Table-top Mt. in Gaspé. From these isolated areas south of the St. Lawrence it extends northward along the outer coast of Newfoundland, and from the north shore of the St. Lawrence "everywhere throughout Labrador to beyond the tree limit"[4]; through Arctic and subarctic regions to Alaska, coming south along the Coast Range to the region of Sitka. Many other characteristic plants of the isolated alpine or colder areas of

[1] Low, Report on Explorations in the Labrador Penninsula: Geol. Surv. Can., Ann. Rep., n. s. viii. 40 L. (1896).

[2] Delabarre, Bull. Geogr. Soc. Phila. iii. no. 4, 190 (1902).

[3] Macoun, Cat. Can. Pl i. 458 (1886).

[4] Low, l c. 38 L. (1896).

Maine and New Hampshire are, like *Empetrum nigrum* and *Rubus Chamaemorus*, the common plants of Labrador and other subarctic and arctic regions of America. Another large group of isolated species is well represented by *Dryas Drummondii*, one of the commonest and most showy plants of the ledgy shores and gravelly beaches of the Gaspé Peninsula and of Anticosti Island. This beautiful shrub, so common in Gaspé and Anticosti, is quite unknown elsewhere east of the Rocky Mts. There, however, it is found throughout the System from northwestern Montana northward, along alpine rivers to the shores of the Arctic Sea.[1]

When, on the other hand, we examine the detailed distribution of the plants which characterize the low altitudes, or at least the every-day inhabited portions of New England and eastern Canada, a very different situation is found. The most familiar plants of these regions, instead of occurring only at few and remote highly specialized stations, are of general or continuous distribution over broad and easily defined areas. Thus, to cite a few typical illustrations, *Clematis virginiana* occurs along streams from the Baie des Chaleurs to Georgia, and west to Lake Winnipeg and the Mississippi valley. *Anemonella thalictroides* is common in dry woods from southern New Hampshire westward to southern Ontario and Minnesota, south to Maryland, and in the upland country to western Florida. *Viola conspersa*[2] occurs very generally in alluvial woods and thickets or in wild meadows from southern Gaspé and eastern New Brunswick west to the Great Lake region, south to Maryland, West Virginia and southern Indiana, and locally along the mountains southward. *Ilex monticola* grows in rich woods of the Alleghanies from northern Alabama northward across Pennsylvania, and locally to the Taconic Mountains of southwestern Massachusetts and the hill-country of western New York. *Aster subulatus* in its general distribution follows the coastal marshes from New Hampshire to Florida. These five species of *Clematis*, *Anemonella*, *Viola*, *Ilex*, and *Aster*, illustrate very fairly the general and continuous distribution of a large proportion of our plants of the north-temperate regions.

The isolation above indicated of the alpine and subalpine plants in New England, Nova Scotia, New Brunswick, and Quebec (as well as on the Adirondack Mts. and in other cold areas of New York, on the

[1] See Macoun, Cat. Can. Pl. i. 132 (1883).

[2] *Viola conspersa* Reichenb. (*V. canina* L., var. *Muhlenbergii* Trautv.).

north shore of Lake Superior, and at other similar points) is of course due in part to the fact that we have in this large district only a limited number of regions in which the climatic conditions are comparable with those of the Arctic. And the occurrence in exposed or frigid situations of Mt. Washington or along the Gaspé rivers of such isolated species as *Empetrum nigrum*, *Rubus Chamaemorus* and *Dryas Drummondii* is one of the strong links of evidence which has convinced botanists of the inevitableness of the conclusions long ago reached by Hooker, Gray, and others, that it is "difficult to account for these facts, unless we admit Mr. Darwin's hypotheses, first, that the existing Scandinavian flora is of great antiquity, and that previous to the glacial epoch it was more uniformly distributed over the polar zone than it is now; secondly, that during the advent of the glacial period this Scandinavian vegetation was driven southward in every longitude, and even across the tropics into the south temperate zone; and that on the succeeding warmth of the present epoch, those species that survived both ascended the mountains of the warmer zones, and also returned northward accompanied by aborigines of the countries they had invaded during their southern migration. Mr. Darwin shows how aptly such an explanation meets the difficulty of accounting for the restriction of so many American and Asiatic arctic types to their own peculiar longitudinal zones, and for what is a far greater difficulty, the representation of the same arctic genera by most closely allied species in different longitudes."[1]

Practically every newly explored alpine district or cliff-region of New England and eastern Canada furnishes its addition to the already extensive list of polar and high-northern species which are isolated south of the St. Lawrence; and to-day we know in this area, between Long Island Sound and the mouth of the River St. Lawrence, more than four hundred such *Pteridophyta* and *Spermatophyta*, a list which would be significantly increased by the addition of the lower groups of plants. But the discovery of a few additions to this very long list of arctic-alpine and high-northern plants south of the St. Lawrence, however interesting it always proves, is, in view of the extensive data already amassed, only of minor importance compared with the greater problem of determining the reasons for this isolated distribution.

[1] J. D. Hooker, Outlines of the Distribution of Arctic Plants: Trans. Linn. Soc. xxiii. pt. 2, 253 (1861). See also Darwin, Origin of Species, Chap. XI; Gray, Am. Journ. Sci. Ser. 2, xxxiv. 144 (1862).

For several years the writer has realized that, in the available information on the occurrence of these plants, a most important factor is missing; and since 1893 much of his field-observation has been directed toward a possible solution of the problem. During the past fourteen summers he has examined over thirty of the mountains of New England and eastern Canada which support more or less pronounced arctic-alpine floras; the cold cliffs of the Maine coast at various points from York to Cutler; the shores of the Bay of Fundy and the southern and eastern coasts of Nova Scotia at remote points; the coast of northeastern New Brunswick and of the Gaspé Peninsula; and the sea-cliffs of the south shore of the St. Lawrence westward to Temiscouata County, Quebec. The studies of these areas and of many river cliffs of northern Maine and eastern Quebec, supplemented by the detailed collections of other botanists and their publications upon the floras of various cliffs and alpine summits, especially of the White and Green Mountains, have furnished the basis for the conclusions here to be presented. In the explorations of the past few summers the writer has had the enthusiastic coöperation of Professor J. Franklin Collins, without whose ever ready ingenuity at "roping" difficult cliffs, it would have been impossible to secure many of these observations.

One of the first impressions gained in botanizing on Willoughby Cliffs or in Smuggler's Notch or on the sea-cliffs of Bic or of Percé, for instance, then on Mt. Washington or Katahdin or Table-top Mt., and then on Mt. Albert, is that alpine floras are very dissimilar. This difference has often been remarked. Dr. A. J. Grout, for example, in describing an ascent of Mt. Washington through Tuckerman's Ravine, says:

"After a climb of about two hours we came into Tuckerman's Ravine proper where the alpine plants began to appear. This reminds one strongly of the Smuggler's Notch ravines, on a much larger scale and the path to the summit zigzags back and forth over towering cliffs similar but less abrupt. One of the most striking things to me was the difference in the flora here and elsewhere on Mt. Washington and that of Smuggler's Notch and Mt. Mansfield. Here in Tuckerman's Ravine were *Salix phylicifolia* both sexes, *Alnus alnobetula* [*A. crispa*] and a number of more common alpine plants, but no *Pinguicula*, neither of our alpine Saxifrages, nor did I see any of our

rare alpine ferns; no *Artemisia Canadensis, Arenaria hirta* [*A. verna*, var. *propinqua*], *Hedysarum* or *Astragalus*. However this deficiency was atoned for by the bright yellow *Arnica Chamissonis* [*A. mollis*], strongly resembling a dwarf sunflower; *Oxyria digyna*, whose very looks seemed to say: 'a near relative of our sorrel'; *Gnaphalium supinum*, which one could easily mistake for our common *G. uliginosum*; *Phleum alpinum* that looks just like dwarfed timothy; *Salix argyrocarpa* in fine fruit, and a form called a hybrid between this and *S. phylicifolia*. Besides these more striking forms, we also collected here *Veronica alpina, Sibbaldia procumbens, Loiseleuria procumbens, Epilobium alpinum*, and *Geum radiatum* [*G. Peckii*]." [1]

Later, at a meeting of the Torrey Botanical Club, Dr. Grout contrasted the flora of the Smuggler's Notch region of Mt. Mansfield; where "are found *Dryopteris* [*Aspidium*] *fragrans, Woodsia glabella* and *W. alpina, Pellaea gracilis* [*Cryptogramma Stelleri*], *Polystichum Braunii, Asplenium viride, Blephariglottis grandiflora* [*Habenaria fimbriata*], *Saxifraga oppositifolia, S. Aizoön*, and *S. autumnalis* [*S. aizoides*], *Astragalus Jesupi* [*A. Blakei*], *Hedysarum Americanum* [*H. boreale*], *Draba incana* [*D. stylaris*], *Arenaria verna* [var. *propinqua*], *Pyrola minor, Gentiana acuta* [*G. Amarella*, var. *acuta*], *Castilleja acuminata* [*C. pallida*, var. *septentrionalis*], *Erigeron hyssopifolius, Solidago Virgaurea*, vars. and that choicest of beauties and wonders, the insect-eating *Pinguicula vulgaris*";[2] with that of the summit-ledges, where are found "*Polygonum viviparum, Comandra livida, Viburnum pauciflorum, Salix Uva-ursi, Vaccinium caespitosum, V. uliginosum, Vitis-Idaea, Nabalus* [*Prenanthes*] *Boottii* and *Diapensia*";[2] and in the abstract of this address, as published, the concluding paragraph reads: "A comparison of the flora of this region and that of Mt. Washington, brings out the fact that here are several northern plants not found at the loftier elevation of the Mt. Washington region, although the conditions there are more severely alpine and supposedly more favorable. None of the saxifrages mentioned above can be found in the White Mountain region, but another alpine species, *S. rivularis*, occurs there. This is only one of several cases hard to account for, on a theory of a residual flora, as the regions are so near to each other and the conditions are so similar." [2]

[1] A. J. Grout, Plant World, ii. 116 (1899).
[2] A. J. Grout, as reported by N. L. Britton, Torreya, ii. 47 (1902).

Had the plants of Smuggler's Notch and of Mt. Washington been further compared with the flora of the great alpine tableland of Mt. Albert in Gaspé the contrast would have been quite as marked, for on that broad expanse of bare summit and cañon-walls the characteristic plants are unlike those either of Mt. Washington or of Smuggler's Notch, and in their stead we find extensive areas of *Adiantum pedatum*, var. *aleuticum*, *Festuca altaica*, *Salix desertorum*, *Arenaria arctica*, *Statice sibirica*, *Solidago decumbens*, *Artemisia borealis*, and many other plants which are unknown elsewhere south of the St. Lawrence.

If, however, comparison is made of the floras of Smuggler's Notch and of Willoughby Cliffs, many sea-cliffs of Bic and the north coast of Gaspé, the mountain- and sea-cliffs of Percé, the cliffs of certain spurs abutting on the northwestern edge of Table-top Mountain, and various river-cliffs in northern Maine, New Brunswick, and the interior of the Gaspé Peninsula; we shall find a remarkable similarity in their floras. In fact, of the 29 distinctively cliff or subalpine plants of Smuggler's Notch all but the local *Astragalus Blakei* are known from the sea-cliffs of Bic and the Gaspé coast, the river-cliffs of the Gaspé interior, or the northwestern abutments of Table-top Mountain; while on the neighboring cliffs of Willoughby only 18 of the 29 notable Smuggler's Notch species are found, though a few others are there present. Furthermore, on the more northern and ordinarily more exposed cliffs of the Gaspé mountains and coast many additional plants are associated with those of Smuggler's Notch and of Willoughby Cliffs; but on none of these areas (except Table-top Mt. discussed below) is there a noteworthy identity with the alpine flora of Mt. Washington.

When, on the other hand, we compare the characteristic alpine flora of Mt. Washington and the adjacent White Mountains with that of Mt. Katahdin or the great alpine tableland (15 miles long, by 3 or more miles wide) of Table-top Mountain, or the coastal cliffs of eastern Maine, we find a striking similarity in these floras. Some of these areas support one or more plants not known in either of the others,[1] but on these three great mountain areas the characteristic species are identical, while several of them occur on the coast of eastern

[1] *Carex capitata*, *Geum Peckii*, *Saxifraga rivularis*, and *Euphrasia Williamsii* on Mt. Washington; *Carex Grahami*, *C. saxatilis*, *C. katahdinensis*, and *Saxifraga stellaris*, var. *comosa* on Katahdin; *Phegopteris alpestris*, *Asplenium cyclosorum*, *Cerastium cerastioides*, *Petasites vitifolia* and *P. trigonophylla* on Table-top Mountain.

Maine and adjacent New Brunswick, on the highest of the Adirondacks, and on several lesser mountains of New England and New Brunswick not here enumerated.

Furthermore, at the exposed summits of Mt. Mansfield and of Camel's Hump in Vermont, where the distinctive plants of Smuggler's Notch are mostly unknown, the following alpine and subalpine plants are found:

Lycopodium Selago L., var. *appressum* Desv.
Agrostis borealis Hartm.
Calamagrostis Pickeringii Gray.
Deschampsia atropurpurea (Wahl.) Scheele.
Hierochloe alpina (Sw.) R. & S.
Poa laxa Haenke.
Carex brunnescens Poir.
" *Michauxiana* Boeckl.
" *rigida* Good., var. *Bigelowii* (Torr.) Boott.
Scirpus caespitosus L.
Juncus filiformis L.
" *trifidus* L.
Luzula parviflora Desf.
Salix balsamifera Barratt.
" *phylicifolia* L.
" *Uva-ursi* Pursh.
Alnus crispa (Ait.) Pursh.
Betula alba L., var. *minor* (Tuckerm.) Fernald.
Comandra livida Richardson.
Polygonum viviparum L.
Arenaria groenlandica (Retz.) Spreng.
Amelanchier oligocarpa (Michx.) Roem.
Potentilla tridentata Ait.
Empetrum nigrum L.
Ledum groenlandicum Oeder.
Vaccinium caespitosum Michx.
" *uliginosum* L.
" *canadense* Kalm.
" *pennsylvanicum* Lam., var. *angustifolium* (Ait.) Gray.
" *Vitis-Idaea* L., var. *minus* Lodd.
Solidago Virgaurea L., var. *alpina* Bigel.
Prenanthes Boottii (DC.) Gray.

Of these 32 alpine and subalpine plants of the high summit-areas of the Green Mountains, plants which are quite different from the distinctive species of the Smuggler's Notch cliffs, 29 are common species of Mt. Washington, Katahdin, and Table-top Mountain; and the remaining 3, although as yet unknown from Table-top, are familiar plants of Mt. Washington and others of the White Mountains, of Katahdin, and even of some of the minor mountains of Maine.

As already remarked, the characteristic plants of the great tableland of Mt. Albert are, so far as known, unique in our flora; and, judging from our very limited knowledge of certain botanically unexplored mountains it is possible that upon them still other alpine or subalpine floras exist. Nevertheless, admitting that there are still highly promising mountains and cliffs within our boundaries whose plants are quite unknown to us, we already have sufficient data to point out three very

clearly defined floras which are quite absent from certain alpine and subalpine areas, but as positively the distinctive plants of certain others.

In the accompanying table is shown the known distribution south of the St. Lawrence and east of the Great Lake region and western New York of 258 alpine and subalpine *Pteridophyta* and *Spermatophyta*. This list includes a large proportion of the New England species, but owing to the lack of sufficiently accurate knowledge of the distribution of certain alpine plants (especially in eastern Canada) they are for the present omitted. Many other species belonging to such perplexing genera as *Calamagrostis*, *Poa*, *Salix*, *Epilobium*, *Campanula*, *Solidago*, *Aster*, etc., must await more detailed study before they can be satisfactorily identified.

It should be borne in mind that, in the preparation of these tables of distribution, only the alpine and subalpine habitats have been included, i. e., the localities in which the plants occur upon soils in place, either upon summit-ledges and upper slopes or on exposed cliffs and talus. In a few cases plants may be present in the bogs or swamps of a given region, but unknown in the rock-habitats. Such species are *Rubus Chamaemorus* and *Menyanthes trifoliata*, for instance, abundant in certain bogs along the lower St. Lawrence, but apparently unknown from the adjacent sea-cliffs and consequently not included from them in the table.

In tabulating the distribution of plants of regions which are not known to the writer from personal observation, it has not always been possible to secure full data, and many plants which are probably present in these localities are necessarily left unchecked. Some of the members of the *Pinaceae*, for example, are undoubtedly upon the cliffs of Smuggler's Notch, but the published lists of plants of that region have naturally laid more emphasis upon the localized species than upon those which are common throughout the Green Mountains, and the presence of many of the latter may be only assumed.

Of the 258 plants whose alpine and subalpine distribution is here tabulated, many species, it will be noticed, are confined very definitely to certain alpine areas, and are quite unknown from certain others. These areas which are characterized by distinctive floras fall into three major groups, and a fourth or minor group (of a single area) supporting a flora which embraces to a striking degree a mixture of plants which are otherwise confined very exclusively to one or the other of two of the major groups of areas.

TABLE I, SHOWING THE DISTRIBUTION SOUTH OF THE RIVER ST. LAWRENCE OF 258 ALPINE AND SUBALPINE PLANTS.

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TABLE I —*continued*.

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TABLE I—*continued*.

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TABLE I—*continued*.

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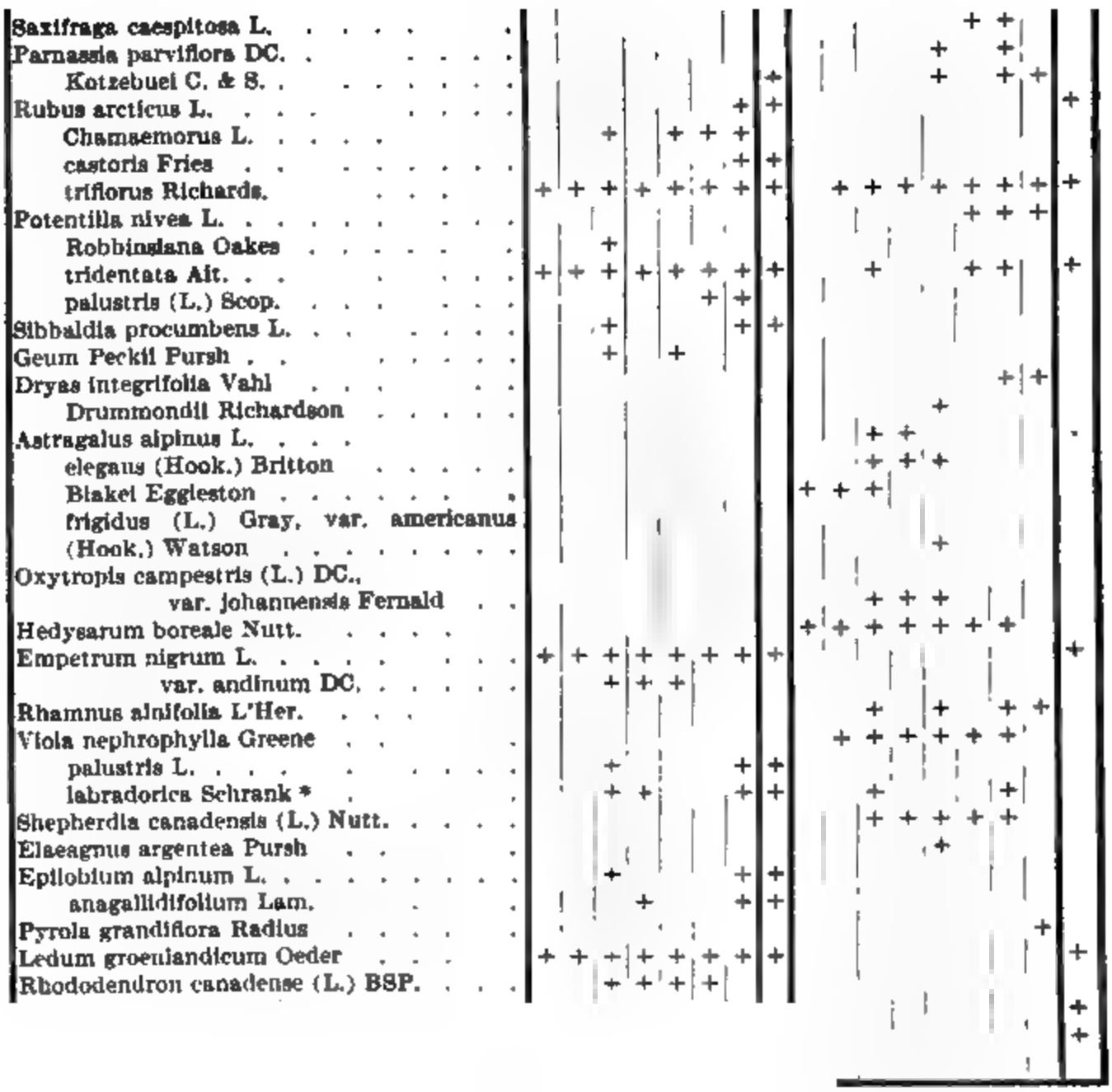
TABLE I —*continued*.



**V. labradorica* Schrank, not *V. conspersa* Reichenb. (*V. canina*, var. *Muhlenbergii* Gray).

TABLE I —*continued*.

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TABLE I —*continued*.

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[1] Summits, and shores of high ponds, Adirondack Mts., New York.

[2] Summits, and shores of high ponds, higher Green Mts. (Mansfield, Camel's Hump, etc.), Vermont.

[3] Summit areas and ravines of the higher White Mts. (Washington, altitude 6300 feet — 1922 meters,— Lafayette, etc.), and shores of high ponds in the White Mts., New Hampshire.

[4] Mt. Katahdin, altitude 5270 feet (1623 meters), the highest point in Maine. For detailed account of flora see RHODORA, iii, 147–184 (1901).

[5] Lesser mountains (Baldpate, Saddleback, Abraham, Bigelow, etc.), of western and central Maine. For account of flora of Mt. Abraham see C. H. Knowlton, RHODORA, i. 191–193 (1899); of Mt. Saddleback see C. H. Knowlton, RHODORA, V. 35–38 (1903).

[6] Mt. Desert Island and adjacent islands and mainland coast, eastern Maine. See Rand & Redfield, Flora of Mt. Desert I., Me. (1894).

[7] Tableland area of Table-top Mt., a high tableland, extreme altitude 4250 feet (1296 meters), extending 15 miles or more north and south, in the western part of Gaspé Co., Quebec. Separated on the west from the Shickshock Mts. by the River Ste. Anne des Monts.

[8] Northern slopes and crests of Mt. Albert, a high tableland, extreme altitude 3900 feet (1195 meters), west of the River Ste. Anne des Monts, and forming the eastern end of the Shickshock Mt. range, in Gaspé Co., Quebec. For list of plants see John Macoun, Trans. Roy. Soc. Can. i, sec. 4, 127–136 (1883).

[9] Smuggler's Notch, a narrow pass shut in by cliff-walls of Mt. Mansfield and Sterling Mt., in northern Vermont. For detailed accounts see C. G. Pringle, Am. Nat. x. 741–743 (1876); H. W. Preston, Am. Nat. xvi. 901–905 (1882); W. W. Eggleston, Bot. Gaz. xx. 72–75 (1895); A. J. Grout, Plant World, ii. 116–118 (1899) and Torreya, ii. 46–48 (1902).

[10] Cliffs and slides on the southwest side of Willoughby Mt., Orleans Co., Vermont. For detailed account see G. G. Kennedy, RHODORA, vi. 93–134 (1904).

[11] Cliffs and ledges of the St. John River and its tributaries, northern Maine and New Brunswick.

[12] Cliffs and ledges of the Restigouche River, New Brunswick and Quebec. For account see G. U. Hay, Bull. Nat. Hist. Soc. N. B. xiv. 12–35 (1896).

[13] Cliffs and ledges of Little Cascapedia, Bonaventure, Grand, Ste. Anne des Monts, and other rivers of Gaspé and Bonaventure Counties, Quebec. For account of the flora of River Ste. Anne des Monts see John Macoun, l. c.

[14] Many cliffs and headlands (conglomerate) of Bic and adjoining towns, Rimouski Co., Quebec.

[15] Sea-cliffs and mountains from Matane River to Cape Marsouin, and at other points on the northern coast of Gaspé Co., Quebec; also Percé, Gaspé Co., Quebec. See Macoun, l. c.

[16] Narrow east and west abutments, northwest of the great tableland of Table-top Mt., Gaspé Co., Quebec. (See 7).

[17] Tableland and exposed cañon-walls, Mt. Albert, Gaspé Co., Quebec. (See 8).

In the areas of the first group — the alpine districts of the Adirondacks of New York; the exposed summits of Mt. Mansfield and Camel's Hump in Vermont; the alpine regions of the White Mts. of New Hampshire; of Baldpate, Saddleback, Abraham, Bigelow, Katahdin, and many lesser mountains of Maine; and of the tableland-area of Table-top in Gaspé; as well as the cliff-coast of eastern Maine — we find a flora many elements of which are common to all these areas, the remaining species being absent for the most part from only one or two. Of the 258 alpine and subalpine plants under consideration 70 (27.1 *per cent.*) are confined exclusively to the areas indicated as Group I (including I*a*); i. e., they are characteristic of the White Mts., Katahdin, or the tableland of Table-top, but are quite unknown from the cliffs of Willoughby or of Percé, or from the tableland of Mt. Albert. These 70 plants include such familiar species and varieties as

Hierochloe alpina.
Calamagrostis Langsdorffii.
Deschampsia atropurpurea.
Poa laxa.
Carex rariflora.
" saxatilis, var. miliaris.
Salix phylicifolia.
" argyrocarpa.
" Uva-ursi.
Salix herbacea.
Arenaria groenlandica.
Rubus Chamaemorus.
Cassiope hypnoides.
Arctostaphylos alpina.
Veronica alpina, var. unalaschcensis.
Rhinanthus oblongifolius.
Solidago Virgaurea, var. alpina.
Prenanthes Boottii.

Of the distinctive plants of the second large group of alpine and subalpine areas,— Smuggler's Notch; Willoughby Cliffs; certain sea-cliffs of Bic and of the north and east coasts of Gaspé; the cliffs of certain northwestern spurs of Table-top Mt., and various river-cliffs of northern Maine, New Brunswick and the interior of the Gaspé Peninsula — there is likewise a very long list, 94 (36.4 *per cent.* of the 258 alpine plants here considered) of which are not, so far as known, ever found associated with the plants which characterize Groups I and III; while 11 others (4.3 *per cent.*) characteristic of Group II are known outside the areas comprising this group only on the north side of Mt. Albert which has already been noted as an anomalous area, Group I*a*. Among the most familiar plants of this large flora (Group II) are

Cryptogramma Stelleri.
Asplenium viride.
Woodsia alpina.
" glabella.
Carex eburnea.
Anemone multifida.
" parviflora.
Draba stylaris.
Saxifraga oppositifolia.
" Aizoön.

Saxifraga aizoides.
Parnassia Kotzebuei.
Dryas integrifolia.
" Drummondii.
Astragalus elegans.
" Blakei.
Hedysarum boreale.
Shepherdia canadensis.
Primula farinosa, var. macropoda.
" mistassinica.
Gentiana Amarella, var. acuta.
Pinguicula vulgaris.
Erigeron hyssopifolius.
Artemisia canadensis.

Although only 27 of these 105 (94 + 11) species characteristic of Group II occur on Willoughby Cliffs and 23 of them on the cliffs of Smuggler's Notch, 102 of the 105 are found on the cliffs of eastern Quebec where they are the characteristic vegetation.

The great tableland and cañon-walls of Mt. Albert, although exposing many square miles of alpine region, have a comparatively meagre flora; but the few species which there abound are of the greatest interest to the eastern botanist, for with but few exceptions they are quite unknown upon any other mountains or cliffs in eastern North America. The plants which are strictly localized in the rock-crevices and on the talus-slopes of Mt. Albert make up, so far as yet determined, a flora of only 21 species (8.15 *per cent.* of the 258 alpine and subalpine plants) but this flora includes the very distinctive

Adiantum pedatum, var. aleuticum.
Cryptogramma densa.
Polystichum scopulinum.
Deschampsia caespitosa, var. alpina.
Danthonia intermedia.
Festuca altaica.
Salix desertorum.
" chlorolepis.
Lychnis alpina.
Arenaria ciliata, var. humifusa.
" sajanensis.
" arctica.
Statice sibirica.
Solidago decumbens.
Artemisia borealis.
" " var. Wormskioldii.
Cirsium muticum, var. monticola.

The area indicated as Group I*a*, the northern slopes and crests of Mt. Albert, while supporting many plants (26) otherwise confined to areas of Group I and several (11) otherwise known only from areas of Group II, has by itself a scarcely noteworthy flora, only 5 plants (1.9 *per cent.* of our alpine species). These plants — *Carex lagopina*, *Luzula spicata*, var. *tenella*, *Sagina saginoides*, *Ranunculus pygmaeus* and *R. Allenii* — are all technical species and varieties and it is not improbable that further exploration will show them to belong primarily to either Group I or II.

The plants referred to in the preceding paragraphs represent a considerable proportion of our alpine and subalpine species and strongly marked varieties which, when they grow upon exposed summits and slopes and cold cliffs, are confined very definitely to certain

isolated localities but are quite absent from many closely adjacent alpine and subalpine areas in which the conditions of exposure, extremes of temperature, and amount of precipitation are seemingly the same. Besides the three primary groups of plants which, south of the St. Lawrence, are confined each to a single mountain or to certain very definite mountains and cliffs, there are several secondary groups of alpine species which are found associated with the members of each of two of the primary groups but not the third; and a rather smaller group of species which show no apparent selection of alpine areas. That is to say, a few plants grow in equal abundance on Mt. Washington, Katahdin, or Table-top (Group I) and on the tableland of Mt. Albert (Group III); others occur on the tableland of Mt. Albert (Group III) and also on the cliffs of Smuggler's Notch, or of the lower St. Lawrence, or on the northwestern abutments of Table-top Mt. (Group II); while only a few species thrive in all these areas (Groups I, II, and III). These facts will perhaps be more clearly brought out by the following summary.

TABLE II.

SUMMARY OF THE KNOWN DISTRIBUTION SOUTH OF THE ST. LAWRENCE OF 258 ALPINE AND SUBALPINE PLANTS ABOVE ENUMERATED, SHOWING THE NUMBER OCCURRING IN THE VARIOUS GROUPS OF AREAS.

	Group.	Species.	Per cent.
Confined to a single group	I	65	25.2
	Ia	5	1.9
	II	94	36.4
	III	21	8.15
Occurring on two or more groups	I & II	12	4.65
	Ia & II	11	4.3
	I & III	32	12.4
	Ia & III	0	0
	II & III	4	1.55
	Ia, II & III	2	0.8
	I, Ia, II & III	12	4.65
		258	100.00

Of the species which abound on Mt. Washington, Katahdin, or Table-top (Group I) and on the tableland of Mt. Albert (Group III) as well, but are unknown on the coastal cliffs of Gaspé and in other areas with an essentially identical flora (Group II) there are 32 (12.4 *per cent.*), of which the following are noteworthy.

Lycopodium Selago, var. appressum.
Carex canescens.
" rigida, var. Bigelowii.
Juncus trifidus.
Betula glandulosa.
Silene acaulis.
Rubus arcticus.
Empetrum nigrum.
Ledum groenlandicum.
Rhododendron lapponicum.
Loiseleuria procumbens.
Kalmia angustifolia.
" polifolia.
Phyllodoce caerulea.
Andromeda glaucophylla.
Vaccinium uliginosum.
" canadense.
" Vitis-Idaea, var. minus.
Diapensia lapponica.
Prenanthes trifoliolata, var. nana.

Twelve other plants (4.6 *per cent.*) unknown from the tableland of Mt. Albert (Group III) are common to districts included in Groups I and II; 11 species (4.3 *per cent.*) are common to Groups I*a* and II, but are unknown from Groups I and III; 4 (1.5 *per cent.*) are common to Groups II and III; and 2 only (0.8 *per cent.*), absent from areas of Group I proper, are known from Groups I*a*, II and III.

Twelve species (4.65 *per cent.*) are common to all the areas. These noteworthy plants are all familiar species:

Larix laricina.
Picea mariana.
" canadensis.
Abies balsamea.
Agrostis borealis.
Carex brunnescens.
" scirpoidea.
Luzula parviflora.
Rubus triflorus.
Potentilla tridentata.
Castilleja pallida, var. septentrionalis.
Viburnum pauciflorum.

It is apparent from this analysis of our alpine floras that, of the 258 plants here enumerated, 185 species and varieties (65 + 5 + 94 + 21) or 71.65 *per cent.* are closely restricted in their occurrence south of the St. Lawrence each to only one of the groups of mountains, cliffs, and alpine areas above tabulated; 61 (12 + 11 + 32 + 4 + 2) or 23.7 *per cent.* are known from two of the primary groups but not the third; and only 12 or 4.65 *per cent.* are found on all three groups of mountains and cliffs. Obviously, with less than 5 *per cent.* of our alpine and subalpine plants showing an inclination to grow upon all our mountain areas, but with more than 95 *per cent.* of the species showing a decided preference either for one group of alpine areas or for two of the groups

but not the third, there is to be found in the characteristics of these areas some influence or group of influences which is of fundamental importance in the distribution of plants.

If we seek in the precipitation and exposure of such districts as the tableland of Table-top Mt. (Group I), the northwestern escarpments of Table-top (Group II), and the tableland of Mt. Albert (Group III), an explanation of the very dissimilar floras of these areas we shall find that, as we should expect, these closely adjacent slopes and summits (the northwestern escarpments and the western edge of Table-top only about ten miles east of the tableland of Albert) have no apparent difference in the amount of precipitation. Nor is the exposure of these cloud-enshrouded districts a significant factor. The flat tableland of Mt. Albert, for instance, and its cañon-valleys with walls facing north, south, east, and west support an essentially uniform flora; similarly, upon Table-top a uniform flora is found upon north, south, east, and west exposures as well as upon the level portions of the tableland. Precipitation and exposure are, then, of only minor importance in determining the localized distribution of our alpine plants.

In attempting to account for the peculiarities of plant distribution much stress has been laid of late upon the degree of fineness or coarseness of soils, and their water-content. But to those intimate with the occurrence of our alpine plants these factors, again, seem of secondary importance. For instance, *Cystopteris montana* on Mt. Albert grows in equal abundance on the firm and steep amphibolite cliffs and in the deep, fine and saturated alluvium of mountain streams. *Selaginella selaginoides*, abundant in the wet mossy bogs of Bonaventure and Gaspé Counties, Quebec, is quite as much at home in the well-drained alpine meadows or in the crevices of either wet or dry rocks, in the latter situation merely becoming stiffer and more stocky than in deep shade or moisture. *Zygadenus chloranthus* is apparently indifferent whether it is in the crevices of sun-baked rock, on cold cliffs, in river-alluvium or in wet bogs. Similarly, many other members of the flora characteristic of the areas classed as Group II grow in wet or dry, fine or coarse soils.

The distinctive plants of Groups I and III, likewise, show a remarkable indifference to the coarseness or fineness, the dryness or saturation of their supporting soils. *Empetrum nigrum*, *Ledum groenlandicum*, *Vaccinium Vitis-Idaea*, var. *minus*, and *Prenanthes trifoliolata*,

var. *nana*, for example, seem equally at home in crevices of sun-baked or spray-showered rock, on sandy plains, in well-drained alpine meadows, and in saturated sphagnum bogs. With our alpine plants so ubiquitous, then, in their occurrence, upon saturated, well-drained, or dry soils, and with an apparent ability to thrive equally well in fine river alluvium or in the crevices of a scarcely altered ledge or cliff, we are hardly justified in depending upon these factors to explain the distribution indicated in the preceding tabulation.

When, on the other hand, we examine the lithological character of the regions in which these plants occur we find a very striking coincidence between the soil-forming rocks of these mountains and cliffs and the distribution of the plants which cover them.

In the first group of alpine areas specially indicated — the great mass of the White Mountains of New Hampshire; the Adirondack Mountains of New York; the highest summits of the Green Mountains of Vermont; Baldpate, Saddleback, Abraham, Bigelow, Katahdin, and nearly all the other naked-topped mountains of Maine; the great tableland of Table-top Mountain in Gaspé; and Mt. Desert Island and other parts of the exposed eastern coast of Maine — the predominant and often the exclusive rocks are granite or gneiss (both containing much orthoclase or potash-feldspar, and generally muscovite or potash-mica) or mica (muscovite)-schist,[1] often in close proximity, and all especially high in potassium. The distinctive soil element of the alpine areas constituting Group I is, then, potassium; and on these mountains and cliffs peculiarly rich in potassic constituents we find 122 of the plants here discussed, nearly two-thirds of which in their alpine distribution are quite unknown on the mountains of Groups II and III.

When, however, we examine the second large group of alpine and subalpine areas we shall find that their characteristic rocks differ from those of the first group — the mountains characterized by granite, gneiss, and mica-schist, rocks which furnished a strongly potassic soil — in one constant point. The cliffs of Percé,[2] of the

[1] For valuable assistance in the determination of several characteristic rock-specimens from eastern Quebec the writer is under special obligations to Professor J. E. Wolff and his student, Mr. H. N. Eaton. Upon these determinations and the detailed reports of members of the Geological Survey of Canada the writer has chiefly depended for the lithological data in this article. He is also indebted for suggestions upon the soil constituents of many rocks to Mr. H. H. Bartlett of the Gray Herbarium.

[2] For details of the mountains and cliffs of Percé see J. M. Clarke, N. Y. State Mus., Rep. lvii. 1. pt. 1 (Bull. 80), 133–171 (1905).

north coast of the Gaspé Peninsula,[1] and of Bic[2] are chiefly limestones, calcareous sandstones, limestone-conglomerates, and calcareous slates; the northwestern escarpments of Table-top Mt., where *Salix vestita* and *S. glauca*, *Saxifraga oppositifolia*, *S. Aizoon* and *S. aizoides*, and *Primula mistassinica* abound, are limestones;[3] the river-cliffs and ledges of many streams of eastern Quebec, northern New Brunswick and Maine, characterized by *Cryptogramma Stelleri*, *Asplenium viride*, *Woodsia alpina* and *W. glabella*, *Carex eburnea*, *Tofieldia glutinosa*, *Astragalus elegans*, *Hedysarum boreale*, *Shepherdia canadensis*, *Primula mistassinica*, *Pinguicula vulgaris*, *Erigeron hyssopifolius*, etc., are chiefly limestones and limy slates (Silurian),[4] or frequently some other rock penetrated by veins of calcite; the famous cliffs at Willoughby where the most notable plants occur are of impure limestone;[5] and the great cliffs of Smuggler's Notch, unknown personally to the writer, are said by those who are familiar with them to show

[1] "On the south side of the St. Lawrence, in the counties of Gaspé and Rimouski, the rocks of the Quebec group are unconformably overlaid by a series of calcareous strata, which we have been accustomed to call the Gaspé limestones."—Logan, Geology of Canada, 390 (1863). For further details see Logan, l. c. 390–453; also Ells, Geol. Surv. Can., Rep. of Progress for 1880–81 and –82, part D D (1883).

[2] "In the vicinity of Bic Harbour there is a great display of the limestone conglomerates and the associated calcareous sandstones of groups B [Lower Silurian conglomerate limestones], and it is to the resistance which they have offered to the destroying agencies that have worn away the other rocks of the coast, that the formation of Bic Harbour is due. . . . .In the limestone conglomerates the masses inclosed are sometimes very large; a boulder of dark gray limestone inclosed in one of the bands at Metis was measured and computed to weigh twelve tons; another in another part of probably the same band measured eleven feet long by six feet broad, and was supposed to weigh upward of twenty-five tons."— Richardson, Geol. Surv. Can., Rep. of Progr. for 1858, pp. 149, 150 (1859). Mr. H. N. Eaton's microscopical examination of rock-samples collected by the writer from two of the Bic headlands showed the limestone and other pebbles and boulders to be held together by a calcareous cement.

[3] "Along the east and west flanks of Table-top Mountain, beds of dark-grey limestone are seen which upon careful examination showed no trace of fossils, but which, on account of their resemblance to the Levis limestones of the coast, described in former reports, and their position in relation to these rocks, are thought to be of the same age [Cambrian].

They appear to have been lifted up by the great granite mass which forms the main portion of Table-top Mountain, and for some distance from their contact with this mass, they show signs of alteration, being more or less changed to a dark-grey marble. The country occupied by these rocks is very mountainous. The ridges run east and west, seemingly along the general strike of the rocks, and are cut by numerous brooks on both sides of the water-shed, distant about six miles from the coast, and between it and the Ste. Anne River.

The mountains have rounded outlines, and are well wooded, although in the vicinity of Table-top they rise to a height of three thousand feet above the sea level, the general height being about fifteen hundred feet."— Low, Geol. Surv. Can., Rep. for 1882–83–84, pt. F. 15 (1884).

[4] See Logan, Geol. of Canada (1863); J. W. Dawson, Acadian Geol. (1878); etc.

[5] See Kennedy, RHODORA, vi. 94, 95 (1904).

distinct incrustations of lime, especially in the sheltered pockets which are the hiding-places of *Cryptogramma Stelleri*. The soils of the second primary group of alpine areas are, then, distinctly calcareous; and on the calcareous mountains and cliffs we find 135 of the species here under consideration,[1] 94 of which are apparently unknown upon the little-calcareous but strongly potassic rocks (Group I) and upon the tableland area of Mt. Albert which constitutes Group III.

This third primary division of our alpine districts, the tableland of Mt. Albert, has long been distinguished among the mountains of Gaspé as an extensive area of serpentine, a soft rock which is essentially a hydrated magnesium silicate. The analysis of typical serpentine as given by Dana is "silica 43.48, magnesia 43.48, water 13.04 = 100," [2] though extensive areas of massive serpentine do not reach this standard of purity. The distinctive soil-element, then, in the third primary division of our alpine areas is magnesium. Now, the presence in a soil of so large an amount of magnesian compounds and the absence of appreciable amounts of potassium and calcium produce conditions exceedingly unfavorable to the majority of plants; and the vast serpentine area of Mt. Albert appears to the unbotanical visitor essentially destitute of vegetation. This impression of the area was well described by Dr. A. P. Low, the discriminating Director of the Geological Survey of Canada, who in the summer of 1883 spent some weeks in a study of the geology of the Shickshock Mts. and of Table-top Mt. Mr. Low says: "The top of Mt. Albert is nearly flat, and is rent by a deep gorge on the east side, which, near its head, splits into several smaller ones. The sides of these gorges are quite destitute of vegetation and the bare serpentine rocks are weathered to a light buff color. On the top of the mountain blocks of serpentine are scattered around, and are partially covered by a thick growth of mosses [chiefly *Racomitrium lanuginosum*] and lichens. Sheltered places are occupied by a stunted growth of black spruce (*Abies nigra*), which rarely attains a height of ten feet. The branches interlace near the ground and form an impenetrable thicket. The whole surface has a dead appearance, and reminds one of the pictures of the moon." [3]

This vivid impression of the serpentine area of Mt. Albert is gained

[1] In Europe many species have been pointed out as confined primarily to calcareous soils. For a bibliography on this subject see Schimper, Pflanzen-Geogr. 129, 130 (1898).

[2] Dana, Man. Geol., ed. 4, 68 (1895).

[3] Low, Geol. Surv. Can., Rep. for 1882–83–84, pt. F. 7, 8 (1884).

by all who visit it, yet upon its seemingly naked slopes, in the crevices of the rock, and among the decomposing boulders, many plants are spread which in the first grand view of the region make little appeal to the eye. As already seen, 21 alpine plants are, so far as known, found south of the St. Lawrence only on the serpentine of Mt. Albert. Other species whose identity is still in doubt carry the number of these distinctive plants well toward forty. Several species also (32), unknown upon the strongly calcareous cliffs and mountains, but abounding on the slopes characterized by potassic rocks — *Betula glandulosa*, *Empetrum nigrum*, *Rhododendron lapponicum*, *Vaccinium uliginosum*, etc.— are equally abundant on the serpentine; 6 others,— *Selaginella selaginoides*, *Cerastium arvense*, *Arenaria verna*, var. *propinqua*, etc.,— are common to the limy rocks and the serpentine; and 12 species are found growing in many stations upon all three groups of mountains. It is, however, important to note that, while the coniferous trees occur as luxuriant forest upon the north slope of Mt. Albert nearly to the summit, reaching an altitude of 3300 feet (1000 meters), and form extensive forests on the high tableland at 3500 to 4000 feet (1050 to 1215 meters) of Table-top Mt.; they are on the serpentine of Mt. Albert only as scattered and uncharacteristic dwarf trees and shrubs, and no forest of appreciable character is seen in the area above the level of Ruisseau à la Neige at an altitude of about 1900 feet (570 meters), where the forest consists of meagre and valueless Bog Spruce (*Picea mariana*). In its meagre appearance the Bog Spruce on the serpentine of Mt. Albert is paralleled by *Rhododendron lapponicum*, *Vaccinium uliginosum*, *Ledum groenlandicum*, and other species, which, having their great development on potassic rocks, are on the serpentine of Mt. Albert very dwarfed and of a starved aspect. The more distinctive plants of the mountain, however,— *Adiantum pedatum*, var. *aleuticum*, *Polystichum scopulinum*, *Festuca altaica*, *Lychnis alpina*, *Arenaria arctica*, *Statice sibirica*, *Artemisia borealis*, etc.— are, especially in damp hollows or along water-courses, luxuriant to a surprising degree; the stipes of the *Adiantum* often exceeding a foot in length, the fronds of the *Polystichum* eighteen inches long, the handsome clumps of *Festuca* with culms two to three feet high, and *Artemisia borealis*, ordinarily only a few inches high, attaining in its var. *Wormskioldii* a height of twelve or fifteen inches, with wand-like inflorescences eight inches in length. From these observations it is concluded that, of the large group of plants which abound upon the

potassic rocks, a few are able to grow, under protest as it were, upon the strongly magnesian soil of Mt. Albert; but that another group of plants, unknown upon our granitic, gneissic, and schistose mountains or on the strongly calcareous mountains and cliffs, are not only restricted to the strongly magnesian rocks, but there attain a normal and often a luxuriant development.[1]

It will be remembered that on the northern edge of Mt. Albert (Group I*a*) two groups of plants are found; some species ordinarily confined to the potassic rocks (feldspathic or micaceous), others generally known only from the strongly calcareous soils. Different sections of the northern and eastern slopes of the mountain examined by Mr. Low showed the rock of the upper or subalpine and alpine district to be chiefly hornblende-schist and amphibolite, with occasional large areas of impure limestone, chloritic slates and schists; and gneiss, made up chiefly of orthoclase (potash-feldspar) and hornblende;[2] and as indicated by rock-specimens kindly examined microscopically

[1] It is interesting, in view of the great abundance on the serpentine of Mt. Albert of *Cerastium arvense*, to note that in 1887 Drs. Hollick and Britton called attention to the fact that on Staten Island *C. arvense*, var. *oblongifolium* "grows abundantly at many places on the serpentine hills, and in no other parts of the Island"; and that an analysis of the ash of the Staten Island plant showed it to contain

"Silica (SiO_2)	39.85
Alumina and Oxide of Iron (Al_2O_3 and Fe_2O_3)	18.58
Lime (CaO)	9.35
Magnesia (MgO)	19.79"

See Hollick & Britton, Bull. Torr. Cl. xiv. 45–50 (1887).

This is a remarkable amount of magnesia to be present in a plant, the average plants of mixed soils deriving from the soil much less magnesia (See Dana, Man. ed. 4, 74).

As a rock plant, *Cerastium arvense* is rare in Maine, only one station, on the rocks between Cape Cottage and the light-house at Cape Elizabeth, being known personally to the writer; and, according to Hitchcock "Cape Elizabeth is largely composed of talcose schist [hydrous silicate of magnesium]"— C. H. Hitchcock, Agr. and Geol. Me., Ser. 2, 1861, p. 162 (1861). It will be noticed that in the tables of distribution *Cerastium arvense* is entered in Group I only from the eastern coast of Maine. The stations are few, the Duck Islands, etc., and it is not improbable that the plant is there on magnesian soil, for Hitchcock records talcose schist and serpentine as largely present along the coast of Penobscot Bay and on some of the neighboring islands. (Hitchcock, l. c., 162–163).

Several other plants of low altitudes have been recorded as occurring primarily on magnesian soils, but as yet such data in regard to North American plants is unfortunately rare.

In Europe, two much-discussed ferns, *Asplenium adulterinum* Milde and *A. Adiantum nigrum*, subsp. *serpentini* (Tausch) Heufler, are clearly demonstrated to grow only on serpentine, and on that rock to take the places respectively of *A. viride*, which prefers calcareous rocks, and *A. Adiantum nigrum* (typical), which is commonly on silicious soils. —For discussion see Luerssen, Farnpfl.165–184, 275–281 (1889), also Schimper, Pflanzen-Geogr. 103, 104 (1898).

[2] Low, Geol. Surv. Can., Rep. for 1882–83–84, pt. F. 17, 18 (1884).

for the writer by Mr. H. N. Eaton, the amphibolite of the northern slope shows, besides hornblende and talc (a silicate of magnesium), calcite (carbonate of lime) and a lime-soda feldspar.[1] In the soil of this slope, then, potassium and calcium are found in such proportion, apparently, as to account for the presence of a few species each of the plants (24 of the potassic rocks, 11 of the calcareous) which ordinarily are found only on soils high in one or the other of these two elements.

But the chief interest of the north slope of Mt. Albert is in the fact that by far the most abundant mineral in the rocks is hornblende, which has as its principal constituents silica, magnesia, protoxide of iron, and lime.[2] Yet, so far as observed, none of the distinctive plants of the serpentine (magnesian) area of Mt. Albert extend across to the hornblende (also magnesian) area. This is obviously due to the hardness and slow decomposition of the hornblende as opposed to the softness and rapid decomposition of the serpentine, but detailed chemical analyses of the soils and plant-ashes, now under way, by Mr. H. H. Bartlett, will, when completed, furnish more satisfactory conclusions as to the exact conditions. Similarly, many questions somewhat outside the intended scope of the present preliminary paper have presented themselves for solution, but before they can be appropriately discussed they must await more detailed field-study and the completion of many chemical analyses.

The foregoing discussion, however, of the relation of our alpine plants to the chief soil-constituents of the rocks upon which they grow, establishes very conclusively the fact that the alpine plants are much more dependent upon the chemical constituents of the soil than has been generally supposed.

[1] Mr. Eaton's analysis of this rock from the north crest of Mt. Albert is as follows:

"A heavy, black schistose rock containing hornblende and feldspar.

In thin section — a holocrystalline rock, composed of hornblende, plagioclase, and talc.

The hornblende constitutes the great bulk of the rock. It is very pleochoric — light yellow, grass green, and greenish blue. Some crystals are idiomorphic, while others are eaten into and show intergrowths with feldspar and calcite.

Feldspar is relatively abundant in allotriomorphic prisms. It is wholly plagioclase. Twinning according to both the carlsbad and albite laws is common. The albite striations make angles of 9, 19, and 36 degrees respectively on three crystals which were tested; proving the species to have a range between a mixture of oligoclase and andesine, through andesine, to basic labradorite.

Talc occurs abundantly in irregular masses between the hornblende crystals, and seems to be a product of hornblende decomposition.

The rock is an amphibolite."

[2] Dana, Man. Geol. ed. 4, 67 (1894).

Unfortunately, the data accompanying herbarium-specimens rarely indicates anything of the soil-characters of the habitats of plants; and, besides, these facts are not easily gained from extensive geological maps. Yet, if we examine the sheets issued by the Geological Survey of Canada, we shall find that in their range outside the areas specially under consideration the plants which we have been discussing show a selection of soils similar to that already pointed out. A few illustrations will make this point more clear.

Empetrum nigrum, the Crow-berry or Curlew-berry, it will be remembered, is one of the commonest plants of the granitic, gneissic, and schistose mountains and coastal rocks of northern New England, New York, and eastern Canada. Outside of this area it abounds on the eastern coast of Newfoundland, throughout the Labrador Peninsula, in Baffin Land and Greenland, and more or less across the Arctic; "along the north shore of Lake Superior, and at Port Arthur.... Thence it takes a northwesterly direction and is found in peat bogs, on exposed rocks along lake shores, and on barren grounds to the Pacific Ocean and Arctic Sea."[1] From the Arctic it extends southward along the Coast Range to the region of Sitka; it is on the mountains of southern British Columbia, and very locally at isolated alpine or coastal stations southward. Many other characteristic plants of the eastern potassic rocks — *Loiseleuria procumbens*, *Vaccinium uliginosum*, *V. Vitis-Idaea*, var. *minus*, *Rubus Chamaemorus*, etc.— follow essentially this distribution and are unknown or of the greatest rarity along the Rocky Mountains. Others, however, such as *Sibbaldia procumbens*, are on the highest peaks of the Rocky Mountain system as well. Another group of these species is well represented by *Vaccinium ovalifolium* which, common on the potassic rocks of Gaspé, is unknown in the Arctic regions and the Rocky Mountains; but occurs from the Aleutian Islands to the mountains of Oregon, also in northern Michigan and in Newfoundland and southern Labrador. Still another group, represented by *Arenaria groenlandica*, is confined to Greenland, Labrador, the north shore of the St. Lawrence, the summit of Table-top, the coast of Nova Scotia near Halifax, the coast of Maine from the Mt. Desert region to the mouth of the Kennebec, the mountain-summits of northern New England and New York, a bleak granite slope below Middletown, Connecticut, and a few iso-

[1] Macoun, Cat. Can. Pl. i. 458 (1886)

lated summits to the highest peaks of the Carolinas. Various minor modifications of these ranges might be given, but these are sufficient to indicate the general distribution of these plants which in New England, New York, and eastern Canada are confined to granite, gneiss, and mica-schist.

Now, if we examine the lithological character of these areas in which *Empetrum nigrum*, *Sibbaldia procumbens*, *Vaccinium ovalifolium*, and *Arenaria groenlandica* abound, we shall find that these plants are commonly on potassic rocks. Thus, as shown by a geological map of Canada, the ancient Archaean area occupies nearly the whole district from Labrador to Lake Superior and the Lake of the Woods, its western boundary thence swinging northwestward to Lake Winnipeg, westward and northward to Lake Athabasca, Great Slave Lake, and then north to the Arctic.[1] This great area is primarily of gneiss, granites and mica-schist, rocks, it will be remembered, which are markedly potassic; and the area of its great development, it will be noted, is strikingly coincident with the general range assigned by Professor Macoun to *Empetrum nigrum*, a plant which in Labrador is reported by Low as "abundant throughout the semi-barren and barren regions of the peninsula, growing freely on the coast and inland,"[2] and by Delabarre as "the most abundant phenogamous plant of Labrador."[3] *Empetrum*, it will be remembered, extends along the Coast Range from the Arctic to the region of Sitka, and locally southward. It is also on the mountains of southern British Columbia, but absent from the general Rocky Mountain area. When we again examine the geological map of Canada, we find that the entire Coast Range is designated as "Coast Granite," and that most of the southern part of British Columbia (immediately north of Washington) is granitic. Similarly, in the Rocky Mountains, where *Sibbaldia procumbens* and some other plants of these potassic rocks occur, the Archaean rocks form the "backbone" of the mountains; and in northern Michigan, where *Vaccinium ovalifolium* is found, and along the crests of the Alleghanies, where *Arenaria groenlandica* occurs, we have isolated southern extensions of the great Archaean axis which is best developed from Labrador to Lake Superior and northwestward.[4]

[1] The boundaries of this Archaean V-shaped mass are very distinctly shown in Dana's Manual, ed. 4, fig. 494. Note there also the isolated areas of Archaean.

[2] Low, Geol. Surv. Can., Ann. Rep. n. s., viii. pt. L. 40 (1896).

[3] Delabarre, Bull. Geogr. Soc. Phil. iii. 190 (1902).

[4] See Dana, l. c.

Furthermore, in the Maritime Provinces of Canada in which we know only a single station for *Arenaria groenlandica* (on rocks near Halifax), granite is of only occasional occurrence; in fact it is quite unknown on the coast between Nova Scotia and the north shore of the St. Lawrence. In Nova Scotia, however, there are some isolated granitic areas, one of the largest extending from Halifax Harbor to Margaret's Bay,[1] the only coastal station for *Arenaria groenlandica* in Canada south of the St. Lawrence. Likewise, at the only station in Connecticut for *Arenaria groenlandica*, the plant is said by its discoverer to grow "on bleak granite rocks below the city [Middletown]."[2]

When, however, we examine the broad range of plants which in New England and eastern Canada are confined to strongly calcareous rocks, we find that they have a distribution quite different in some details from those just examined. The range of *Dryas Drummondii* — on the limy rocks and gravels of the Gaspé Peninsula, on Anticosti, and generally along the rivers of the Canadian Rockies — has been noted. Many other plants show a similar range. Now, as indicated on the recent geological map of western Canada, the general area occupied by the Canadian Rocky Mountains is called Palaeozoic, a general classification to cover much of the area indicated on a previous map merely as "limestone"; and in his Journal of a Boat Voyage through Rupert's Land and the Arctic Sea, Sir John Richardson mentions *Dryas Drummondii*, *Hedysarum boreale*, *Elaeagnus argentea*, *Shepherdia canadensis*, and several other plants of our calcareous cliffs and gravels as abounding on the limestones of the Mackenzie River.[3] Other plants of our limestone mountains and cliffs occur at somewhat scattered stations in Newfoundland, Labrador, and Arctic America; and a few of the plants, which south of the St. Lawrence are confined to the magnesian soils of Mt. Albert, are also known at isolated points from Newfoundland northward.

In order to test, so far as it is possible to do so without more accurate

[1] See Geological map of Nova Scotia, New Brunswick and Prince Edward Island, by J. W. Dawson, in Acadian Geology (1878).

[2] H. L. Osborn in letter to Asa Gray, May 17, 1878.

[3] "The dogwood, silvery opulaster (*Elaeagnus argentea*), *Shepherdia*, and *Amelanchier* grow on banks that in Europe would be covered with gorse and broom, and the southern *Salix candida* is replaced by the more luxuriant and much handsomer *Salix speciosa*, which is the prince of the willow family. The *Hedysarum Mackenzii* and *boreale* flower freely among the boulders that cover the clayey beaches; while the showy yellow flowers and handsome foliage of the *Dryas Drummondii* cover the limestone debris."— Richardson, Arct. Searching Exped. 123 (1852).

data than exists upon herbarium-labels, the conclusions above reached, the writer has listed all the stations known to him, either from specimens or authentic reports, in arctic and subarctic British America, for fifteen of the more typical plants of the alpine districts of New England, New York and eastern Canada. In this work he has been greatly assisted by the map of Arctic British America and the accompanying notes published by Dr. G. M. Dawson.* In order to make the test more valuable the fifteen plants whose ranges were thus studied were selected equally from those of the three groups above tabulated. All together 55 stations or definite regions for these fifteen plants have been found. Of these, 7 are either not indicated on available maps or are too vaguely stated on the labels to be of service. The remaining 48 stations are listed in the following tabulation, and in each case the rock of the region, which could furnish the soil-elements for which the plants show distinct preferences in New York, New England, and eastern Canada, is noted.

TABLE III.

SHOWING THE KNOWN STATIONS OR REGIONS, FROM NEWFOUNDLAND TO ARCTIC BRITISH AMERICA, FOR 15 ALPINE PLANTS OF NEW YORK, NEW ENGLAND AND EASTERN CANADA.

GROUP I (Plants which, south of the St. Lawrence, are controlled in their Distribution by a Preponderance of Potassium in the Soil.) Stations, and Rocks of the Region from which Potassic Soils could be derived.	Eriophorum callitrix	Carex rariflora	Arenaria groenlandica	Rubus Chamaemorus	Empetrum nigrum
Cape Ray and Channel to White Bay, Newfoundland (Archaean [1])				+	+
Despair Bay to Fogo Island, etc., Newfoundland (Archaean [1])	+		+	+	+
Southeastern Newfoundland (Archaean [1])	+			+	+
Baie Ste. Claire, Pointe-Ouest, etc., Anticosti (granite, gneiss [2])	+			+	+
North shore of St. Lawrence from Cap à l'Aigle to Bradore Bay, Quebec (granite, gneiss [3])	+	+	+	+	+
Red Bay, Labrador (gneiss [4])	+				+
Sandwich Bay, Labrador (syenite [5])			+		
St. Lewis Inlet, Labrador (syenite, gneiss [6])		+		+	

* Geol. and Nat. Hist. Surv. Can., Ann. Rep. n. s., ii. pt. R (1887).

TABLE III —*continued.*

Seal Island, Labrador (gneiss [7])									+	
Webeck Harbor, Labrador (gneiss, syenite [8])							+			
Hopedale, Labrador (gneiss, granite [9])						+	+	+	+	+
Paul's Island, Labrador (gneiss [10])						+		+		+
Nain, Labrador (gneiss [11])						+	+		+	+
Hebron, Labrador (gneiss [12])						+			+	
Ungava Bay, Cape Chudleigh, Labrador (gneiss [13])						+	+		+	
Cumberland Sound, Baffin Land (gneiss, granite [14])						+				
Nottingham Island, Hudson Strait (gneiss, syenite [15])						+			+	+
Cape Prince of Wales and Ashe's Inlet, or North Bluff, Hudson Strait (gneiss [16])									+	
Richmond Gulf, Ungava (feldspathic argillite, gneiss, etc.[17])						+				
Great Whale River, Ungava (gneiss [18])						+				
Lake Mistassini, North East Territory (gneiss [19])						+	+			
Fort Churchill, Hudson Bay (felspathic arkose, etc.[20])									+	+
Chesterfield Inlet, Hudson Bay (granite, gneiss [21])									+	+
Great Bear Lake, Mackenzie (granite, gneiss [22])							+			
Fort Resolution, Great Slave Lake, Mackenzie (granite [23])									+	
Athabasca Plains, Athabasca (granite and gneiss [24])									+	+

[1] Dana indicates a "central Newfoundland range" of Archaean, and "two other ranges farther east," the only one shown on his map running from Despair Bay northeastward to Fogo Island region. On Logan's map in the Atlas accompanying the Geology of Canada (1863) the southeastern district of Newfoundland is also indicated as chiefly Archaean.

[2] "Cette soi-disant forêt sur laquelle on marche . se trouve en quelques endroites de la côte, comme à la Pointe-Ouest, par example. Là, la végétation se présente, en effet, sous l' aspect d' un tapis serré de plantes basses (*Arctostaphylos Uva-Ursi*, *Vaccinium Vitis-Idaea*, *Vaccinium pennsylvanicum*, *Ribes oxyacanthoides*, *Empetrum nigrum*, etc.), formé en outre de tous petits sapins et d'épicéas tourmentés. . .Cette plateforme nous montre ici une succession de lits minces de calcaires argileux le plus souvent peu fossilifères. Notre promenade ayant lieu pendant la basse mer, nous rencontrons des blocs erratiques, parfois nombreux et groupés dans de petites anses, parfois isolés, çà et là, et sur lesquels nous reviendrons à propos de la période quaternaire. Presque tous ces blocs sont formé de roches cristallines (granit, gneiss, anorthosite, etc.)"— Schmitt, Monographie de l' Ile d' Anticosti, 11, 70 (1904).

[3] "With the exception of a narrow border of Silurian strata on the Strait of Belle Isle, another at the mouth of the Mingan River, and a third near the Seven Islands, with the addition of two narrow Silurian strips running a few miles up the Murray River and the Gouffre, the north shore of the St. Lawrence is the southern boundary of this ancient series of deposits [Laurentian, chiefly granites and gneisses] from Labrador to Cape Tourmente"— Logan, Geol. Can. 47 (1863).

[4] "Looking up through the bays and harbors we can see the low conical hills of Laurentian gneiss"— Packard, Lab. Coast, 281 (1891).

[5] "The Laurentian rocks [at Sandwich Bay] rise into high, rugged, and broken syenitic hummocks."— Packard, l. c. 281 (1891).

[6] "We pass St. Lewis Bay . . . .with its north shore evidently syenitic. . . .the headlands of syenite probably extend out from the gneiss mainland."— Packard, l. c. 137 (1891).

[7] "At Seal Island the 'Domino gneiss' of Lieber appears, protected seaward by high islands intermixed with low gneiss 'skiers'."— Packard, l. c. 158 (1901).

[8] "Cape Webuc or Harrison, which is a lofty gneiss headland, faced with syenite."— Packard, l. c. 181 (1901).

[9] "The island on which Hopedale is situated is of the ordinary Laurentian gneiss which behind the mission house is curiously contorted; it is fine-grained, distinctly banded, with veins of quartz and of granite."— Packard, l. c. 206 (1901).

[10] "On going ashore at Ford's Harbour [Paul's Island], I found the gneiss to consist of common reddish and greyish varieties."—Bell, Geol. and Nat. Hist. Surv. Can., Rep. of Progr. for 1882–83–84, p. 11 DD (1884).

[11] "The rock here [Nain] consists of a rather light grey gneiss."— Bell, l. c. 12 DD.

[12] "At this mission station [Hebron], the rocks were examined and found to be common biotite gneiss and amphibolites, intersected by trap dykes."— Daly, Bull. Mus. Comp. Zool., Harvard, Geol. Ser. V. no. 5, 216 (1902).

[13] "The rock everywhere [Ungava Bay at Port Burwell] consists of ordinary varieties of gneiss."— Bell, l. c. 18 DD (1901).

[14] "Dr. Boas describes the nucleus of the mountain masses [Baffin Land] as everywhere gneiss and granite."— G. M. Dawson, Geol Surv. Can., Ann. Rep. n. s. ii. 40 R (1887).

[15] "I explored the country [Nottingham Island] to a distance of about three miles in various directions from our anchorage, and found the rocks to consist of common varieties of gneiss, the only exception noticed being patches of a fine-grained red syenite on both sides of the inlet." — Bell, l. c. 28 DD (1901).

[16] "The rocks on the west side of Ashe's Inlet consist of dark grey gneiss, composed principally of quartz and felspar in even beds. . . .The rocks in the vicinity of the bay [Stupart's Bay, Prince of Wales Sound] were found to consist entirely of Laurentian gneiss."— Bell, l. c. 21, 25, DD (1901).

[17] "It [Richmond Gulf] is surrounded by high hills. On the west, sharp cliffs, formed by the broken faces of the Manitonieck rocks [felspathic argillites], which dip toward the sea, rise in places twelve hundred feet above the water. The south and east sides are bounded by lower rounded hills of Laurentian and Huronian rocks."— Low, Geol. Surv. Can., Ann. Rep. n. s., iii. 55 J (1888).

[18] "At the fifteen foot chute [Great Whale River] the rock is similar to the last, and from here to the mouth of the river all the exposures examined were made up of red and grey hornblende orthoclase gneiss, the red predominating."— Low, l. c. 54 J (1888).

[19] "The greater part of the shore-line here [west side of Lake Mistassini] being formed of gneiss, perpendicular faces are wanting."— Low, l. c. viii. 68 L (1896).

[20] "The rock [at Port Churchill] is a greenish-gray even-grained, false-bedded, felspathic arkose sandstone."— Tyrrell, Geol. Surv. Can., Ann. Rep. n. s. ix. 90 F (1897).

[21] "Granites and gneisses occur along the north shore of Baker Lake, and down both shores of Chesterfield Inlet to its mouth."— Tyrrell, l. c. ix. 169 F (1897).

[22] "The rocks of the southeast extremity of McTavish Bay [southeastern arm of Great Bear Lake] are described as red granites and gneisses."— G. M. Dawson, l. c. 19.

[23] "Near the easternmost [channel of Slave River], which is named John's River (*Rivière à Jean*), is Stony Island, a naked mass of granite, rising fifty or sixty feet above the water; and beyond that, to the eastward, the banks of the lake [Great Slave Lake] are wholly primitive."— Richardson, Arct. Searching Exped. 97 (1852).

[24] "They [Laurentian rocks] occupy most of the northern shores of Athabasca and Black Lakes. Throughout the greater portion of the area, the rock consists of light reddish-gray hornblende-granite, and biotite-granite or granitoid gneiss."— Tyrrell, l. c. viii. 16 D (1896).

"In the *second* or *barren ground* district, in places where the soil is formed of the coarse sandy *debris* of granite. . . .*Rhododendron lapponicum*, *Kalmia glauca* [*polifolia*], *Vaccinium uliginosum*, *Empetrum nigrum*, *Ledum palustre*, *Arbutus* [*Arctostaphylos*] *Uva ursi*, *Andromeda* [*Cassiope*] *tetragona*, and several depressed or creeping willows, lie close to the soil."— Richardson, l. c. 416 (1852).

TABLE III—*continued.*

	Anemone parviflora	Saxifraga caespitosa	Saxifraga oppositifolia	Dryas integrifolia	Pinguicula vulgaris
Bay of Islands to Cape Norman, Newfoundland (limestone [1])	+			+	+
Anticosti (limestone [2])	+	+	+	+	+
Mingan Islands, Quebec (limestone [3])					+
Forteau Bay, Labrador (limestone [4])		+		+	+
Chateau Bay, Labrador (basalt, trap [5])		+			+
Battle Harbor, Labrador (trap, etc.? [6])		+	+	+	+
Indian Harbor, Labrador (doleritic trap containing labradorite [7])					+
Hopedale, Labrador (doleritic trap, labradorite [8])	+	+		+	+
Paul's Island and Nain, Labrador (labradorite, gabbro, anorthosite [9])	+	+	+	+	+
Kaumajet Mts., Okkak to Cape Mugford, Labrador (diabase, limestone [10])			+	+	+
Torngat Mts., Hebron to Nachvak Bay, Labrador (diabase, limestone, calcspar [11])	+	+	+	+	+
Ungava Bay, Cape Chudleigh, Labrador (dolomite, limestone [12])		+		+	+
Grinnell Land (limestone [13])		+		+	
Cape Sabine, Smith Sound (limestone [13])		+	+		
Jones Sound, Ellesmere Land (limestone [14])			+	+	
Cumberland Sound, Baffin Land (Middle Laurentian rocks? [15])			+	+	
Cape Prince of Wales and Ashe's Inlet, or North Bluff, Hudson Strait (dolomite, limestones, calcspar [16])		+	+	+	
Mansfield Island, Hudson Bay (limestone [17])		+	+		
Foot of James Bay, Moose Factory to Rupert House (limestone [18])	+			+	+
Fort Churchill, Hudson Bay (limestones [19])				+	+
Melville Island (limestone, calcareous sandstone [20])		+	+	+	
Fort Good Hope, Mackenzie River (limestone [21])				+	+
Great Slave Lake, Mackenzie (limestone [22])					+

[1] "On the opposite side [of the Strait of Belle Isle], the shore of Newfoundland is occupied by a series of limestones, apparently of Calciferous age . they stretch along the coast for upwards of a hundred miles."— Logan, Geol. Can. 288 (1863).

These and other limestones are traced in succeeding pages and shown in the accompanying Atlas southward to Bay St. George.

[2] Anticosti Island is composed of Silurian rocks, chiefly limestones, which are discussed in detail in Logan's Geology of Canada, Chapters x and xii See also Schmitt, Monographie de l' Ile d' Anticosti, 65–99 (1904). In view of a very general impression that *Sphagnum* does not occur in calcareous regions and of its abundance in certain marly bogs of Gaspé Co., Quebec (see RHODORA, vii, 8), it is interesting to note the statement of Sir William Logan that "the most extensive peat deposits in Canada are found on Anticosti. Along the low lands on the south coast of the island, from Heath Point to within eight or nine miles of Southwest Point, a continuous plain covered with peat

extends for upwards of eighty miles, with an average breadth of two miles; thus giving a superficies of more than one hundred and sixty square miles. The thickness of the peat, as observed on the coast, was from three to ten feet."— Logan, l. c. 783, 784 (1863).

[3] "It is not until reaching the Mingan Islands, between 500 and 600 miles to the northeastward, that we have any of its [Calciferous formation] characteristic fossils....At the Mingan Islands and on the neighboring coast, there appears an interesting extension of this formation extending from Mingan River to Ste. Geneviève Island, a distance of about forty-five miles. It occupies the inner range of islands and most of the coast."— Logan, l. c. 119 (1863).

[4] "Between this exposure [Mingan Islands] and Bradore Bay, the distance is about 300 miles. The shore, which is very much indented by bays and inlets, and fringed with a multitude of islands, presents an almost continuous line of bare rock; but in no part of it have there been observed any strata, but such as belong to the Laurentian series. On the east side of Bradore Bay, which is situated near to the entrance to the Straits of Belle Isle from the Gulf of St. Lawrence, the palaeozoic rocks again present themselves. Resting on the Laurentian gneiss, they run along the north coast for nearly eighty miles, with a breadth of probably ten or twelve miles....On the strike, these yellow-weathering limestones pass in some parts into grey, compact, pure limestone....In Forteau Bay, the whole mass appears to be more or less fossiliferous."— Logan, l. c. 287, 288 (1863).

[5] "At Henley Harbor [Chateau Bay] is a system of trap-rocks....These rocks consist of three masses of columnar basalt, capping the syenitic gneiss. It is a hard, fine, compact dolerite....West of these basaltic rocks, on the opposite side of the harbor, is a large trap overflow forming a hill over three hundred feet high."— Packard, Lab. Coast, 285, 286 (1891).

[6] I am unable to find any specific statement in regard to Battle Harbor, which is situated between Chateau Bay (5) and the great anorthosite area of St.Michael Bay.

[7] "At Indian Harbor....these same rocks ['Domino Gneisses'] appear....Invariably accompanying these rocks is a doleritic trap of a peculiar mineralogical character.... It is composed of large crystalline masses of hypersthene and labradorite [a lime-soda feldspar]"— Packard, l. c. 288, 289 (1891).

[8] "About an hour before we reached Hopedale, we passed a high sugar-loaf-shaped island 'The Beacon'....The rock was evidently that variety of syenite containing labradorite [a lime-soda feldspar] and green hornblende."—Packard, l. c. 197. Trap dykes (doleritic) like those at Chateau Bay were seen at Hopedale, "in places like slightly winding stairs or steps descending to the water's edge, justifying the term *trap* applied to this rock, which is from the Swedish *trappa*, meaning a series of steps or stairs."— Packard, l. c., 206, 286 (1891).

[9] "The Hopedale gneiss underlies the eastern end of Paul's Island, but a few miles west of Ford Harbor, it comes in contact with the famous anorthosite [a lime feldspar] and allied gabbro whence is derived the schillerizing labradorite....The 'Brave' was headed for Nain, passing through a long tickle walled in on either side by high cliffs of massive gabbro for fifteen miles....all the mainland visible thereabouts is composed of the gabbro."— Daly, Bull. Mus. Comp. Zool., Harvard, Geol. Ser. v. no. 5, 216–218 (1902).

[10] At Mugford, "next above the light colored zone of the schists comes a series of black slates fifty to one hundred feet thick, indurated at the contact by a conformable three hundred-foot sheet of apparently intrusive diabase [containing labradorite]....On Ogua'lik at the southwest end of the Tickle, the gneisses are overlain by an intrusive sheet of diabase, about fifty feet in thickness, upon which are piled slates, quartzites, limestones, and sandstones with interbedded traps."— Daly, l. c. 220, 221 (1902).

[11] Daly (l. c. 225, 226) discusses the sedimentary and intrusive rocks of this range, which are similar to those of the Kaumajet Mts. See also Bell, Geol. and Nat. Hist. Surv. Can., Rep. for 1882–83–84, 15 DD, etc. (1884).

"On the west shore of the first cove, from the entrance, on the south side of Nachvak inlet, the rocks consist of a coarse-grained slaty tufa or breccia....to the south of it is a coarse grey mica schist....In this rock, and near the slaty breccia, a vein of quartz was found, from a foot to two feet in thickness, and holding patches of brown-weathering calcspar."— Bell, l. c. 15, 16 (1884).

[12] "A short distance south of the station, a vein, varying from 8 to 13 inches in width, occurs in the gneiss....It consists of light grey dolomite [calcium-magnesium carbonate] and white quartz....Fragments of grey, drab and yellowish limestone, with obscure fossils, were common around the base of the hill."— Bell, l. c. 18, 19 (1884).

[13] Dr. G. M. Dawson, quoting from a paper of Fielden and De Rance, says: "A limestone formation, resembling that elsewhere so widely spread in the Arctic regions, is described as characterizing considerable tracts on both the east and west sides of Kennedy Channel and Smith's Sound....Carboniferous limestones were recognized in several places along the north coast of Grinnell Land....'There would also appear to be a strong likelihood that the limestone continues in a southeasterly direction by way of these mountains [the United States range] across the whole of Grinnell Land'."— G. M. Dawson, Ann. Rep. Geol. Surv. Can., n. s., ii. 51, 52 R (1887).

[14] As indicated by Dawson little is known of the rocks of Ellesmere Land. The "Cape Rawson Beds" [containing limestones], however, are known there.

[15] "The southern part of Baffin Land, including Frobisher Bay and Cumberland Sound together with Melville Peninsula, may be particularly referred to as evidently exhibiting a considerable development of Middle Laurentian rocks [including crystalline limestones]."— Dawson, l. c. 7.

[16] "Among the prevailing gneiss boulders, scattered on the hills and plains, were found several of grey dolomite....A small piece of greyish crystalline limestone was picked up near Ashe's Inlet....Here [Eskimo Inlet, Prince of Wales Sound] I found a good many boulders of grey and yellowish limestone on the beach....One of the veins of white quartz in this locality contains purplish red calcspar,....resembling some of the banded crystalline limestones of the Laurentian series."— Bell, l. c. 22–27.

[17] "We arrived at the eastern part of Mansfield Island, about mid-way down, on the morning of the 30th of August. Its even outline presented a remarkable contrast to the shores of Hudson's Strait. It resembled a gigantic ridge of gravel; but stratified rocks, in low horizontal ledges, appeared here and there, through the *debris*, at different levels....I landed at a point about the middle of the eastern shore of the island, and found the shore very flat, with shallow water for a considerable distance out. The rock proved to be a fossiliferous grey limestone, in rather thin horizontal beds."— Bell, l. c. 33.

[18] "To the west and south it [shore at foot of James Bay] is almost flat, with its soil overlying nearly horizontal beds of Silurian and Devonian limestones for about one hundred and fifty miles inland to the Archaean country."— Low, Ann. Rep. Geol. Surv. Can., n. s. iii. 16 J (1888).

[19] "In a fissure [at Port Churchill]....is, or was, a small outlier of an unaltered Cambro-Silurian limestone....With the above are associated some fragments of white Silurian limestone....In and around the old fort at the mouth of the river, are many boulders of heavier-bedded Trenton limestone."— Tyrrell, Ann. Rep. Geol. Surv. Can., n. s. ix. 91 F (1897)

[20] "The surface of it [Table-hill, Melville Island] consists generally of sand. on which are lying numerous masses of limestone....We had passed, during our last march, a good deal of rich soil....and the sorrel and saxifrage (*Saxifraga oppositifolia*) were more abundant than before....On the north side of this ravine large masses of sandstone were lying on the surface of the ground,....and we remarked on this, and several other occasions, that the stones which were bruised by the wheels emitted a strong odor, like that of fetid limestone when broken."— Parry, First Voyage. Journal, 177, 184–85 (1821).

[21] "At night we camped not far from the Old Fort [Good Hope]. The shale, sandstone, and limestone beds, continue throughout the space intervening between the former and present sites of Fort Good Hope."— Richardson, Arct. Searching Exped., 135 (1852).

[22] "In the vicinity of the westernmost channel of the delta [of Slave River] and from thence to the efflux of the Mackenzie, the whole southern shore of the lake is limestone" — Richardson, l. c. 97.

TABLE III—*continued.*

	Lychnis alpina	Arenaria arctica	Arenaria anjanensis	Statice allitrica (and perhaps others)	Artemisia borealis
Coal River, Newfoundland (serpentine [1])	+	+		+	+
Hopedale Islands, Labrador (trap [2])	+	+		+	+
Paul's Island, Labrador (gabbro, pyroxene [3])	+			+	+
Nain, Labrador (gabbro [3])	+	+		+	+
Kaumajet Mts., Okkak to Cape Mugford, Labrador (basalt, lavas [4])			+	+	+
Torngat Mts., Hebron to Nachvak Bay, Labrador (black diorite, soapstone [5])	+		+	+	+
Ungava Bay, Cape Chudleigh, Labrador (dolomite [6])	+			+	
Cape Prince of Wales and Ashe's Inlet, or North Bluff, Hudson Strait (dolomite, black mica, soapstone [7])		+		+	
Nottingham Island, Hudson Strait (dolomite [8])			+	+	

[1] On Bonne Bay, "there rises to a height of between 2000 and 3000 feet, a mountain of serpentine."— Logan, Geol. Can. 293 (1863). These serpentine mountains, as shown on the geological map of Canada, are greatly developed southward to Port au Port Bay. Coal River has its origin upon one of them, and its lower waters flow through another of the serpentine areas.

[2] "Trap dykes were always in the view [Islands off Hopedale]."— Daly, Bull. Mus. Comp. Zool., Harvard, Geol. Ser. v, no. 5, p. 216 (1902).

[3] "The 'Brave' was headed for Nain, passing through a long tickle walled in on either side by high cliffs of massive gabbro." Daly, l. c. 217. "When at Nain I obtained specimens of paulite, a variety of pyroxene or hypersthene [a silicate of magnesium], which was said to have been brought from Paul's Island" - Bell, Geol. & Nat. Hist. Surv. Can., Rep. for 1882-83-84, p. 12 DD (1884).

[4] "The basalt [containing crysolite a silicate of magnesium] agglomerate, which is also a significant part of the stratified series, is typical." - Daly, l. c. 221.

"Ogua'lik, Cape Mugford, the Bishop's Mitre are all part of an extensive area of slates, sandstones, conglomerates, limestones, and, much surpassing these in thickness, lava flows, volcanic tufts and breccias."— Daly, Bull. Geogr. Soc. Phila. iii, 208 (1902).

[5] "Some dykes of close-grained, almost black diorite [black diorite usually contains much augite, a silicate of magnesium], also cut the gneiss in the vicinity of Skynner's Cove. I was informed that the Eskimo obtained a kind of soapstone [a hydrous silicate of magnesium] for making their pots in the vicinity of Skynner's Cove. dykes [of black-looking rock] were seen all along, cutting the face of the mountain range." — Bell, l. c. 15 DD.

[6] "A short distance south of the station [at Port Burwell, Cape Chudleigh], a vein . . occurs in the gneiss. It consists of light grey dolomite [magnesian limestone] and white quartz" — Bell, l. c. 18 DD.

[7] "Scattered on the hills and plains [near North Bluff, Hudson Strait], were several [boulders] of grey dolomite. . . . and of the soft buff grey dolomite."— Bell, l. c. 22 DD.

"On the west side of Ashe's Inlet. . . . some of them [veins] contain feldspar and black mica [magnesian]."— Bell, l. c. 29 DD. "At Ashe's Inlet a party of Eskimo from the eastward came on board." Among the rocks shown them "they recognized a rather hard and inferior variety of soapstone,"— Bell, l. c. 21, 24, 25 D D.

[8] "At a projecting point. . . . I found some straggling veins of hard grey dolomite."— Bell. l c. 29 D D.

It is not, of course, possible from the inadequate data at hand to say with certainty that in their arctic and subarctic distribution in British America the fifteen plants just discussed are confined to or even occur upon the soils which have respectively a preponderance of potassium, calcium, or magnesium; but it is clear that in the northern regions from which these plants are known soils are present similar to those upon which the plants have their best development south of the St. Lawrence. In their southern stations, however, it is apparent that the plants of alpine situations here considered show in most cases a pronounced selection of habitats dependent upon the relative abundance in the soil of the three important food-elements, potassium, calcium, and magnesium. A very similar selection of soils is shown by many plants of low altitudes; in fact, it is possible thus to analyze the distribution of the majority of *Pteridophyta* and *Spermatophyta* of New England and eastern Canada. It is very generally known, for instance, that many heaths (*Kalmia, Rhododendron, Vaccinium,* etc.) occur primarily on potassic soils; and that they are rare or quite unknown in extensive areas of limestone and can there be cultivated with success only if provided with an imported soil free from the abundant lime of the region.[1] Many other plants of low altitudes or of temperate regions, *Camptosorus rhizophyllus, Pellaea atropurpurea, Carex eburnea,* etc., are best developed on if not confined to calcareous rocks. These plants of low altitudes, *Kalmia latifolia, Rhododendron canadense* (*Rhodora*), *R. maximum, Vaccinium pennsylvanicum, Camptosorus, Pellaea atropurpurea, Carex eburnea,* etc., restricted in their best development to somewhat specialized soils and ordinarily absent

[1] "Any open, well-drained soil which does not contain limestone or heavy clay and has a moist and fresh subsoil will prove satisfactory [for Rhododendrons]. Where limestone or heavy clay prevails, beds must be specially prepared and filled with suitable soil."— A. Rehder, in Bailey, Cycl. Am. Hort. 1516, 1517 (1902).

"It is generally conceded that lime soils and manures containing lime . . . . are injurious to Rhododendrons; in limestone regions it is undoubtedly advisable to substitute, for the natural soil, others which are free from this objectionable element."— B. M. Watson in Bailey, l. c. 1519.

from certain others, occupy, in a general way, wide areas in eastern America; and, though absent from certain localities, they may be said to have a far more continuous range than the alpine species, and the intervals between their more isolated outlying colonies are not too great to be crossed by seeds and spores in the ordinary processes of dispersal.

The alpine plants, on the other hand, are, as already noted, present in our flora usually as small colonies isolated by hundreds or even thousands of miles from the other known members of their species. *Dryas Drummondii*, for example, one of the most abundant plants of the Canadian Rockies, has its nearest known colonies 2000 miles away, along the rivers of the Gaspé Peninsula and of Anticosti. *Polystichum scopulinum*, abundant on steep serpentine walls of Mt. Albert, Gaspé, is otherwise confined to mountains from Idaho to northern California, at least 2200 miles away. *Festuca altaica*, the commonest grass of Mt. Albert, is otherwise known only from Yukon, 2700 miles to the northwest, and from the mountains of Asia. Other species, though very isolated in their occurrence, are found at one or more points between our New England and Gaspé mountains and the northwestern portion of the continent. Among such is *Vaccinium ovalifolium* whose range has been already stated. These plants, typical of our alpine and subalpine species, often occur, then, in such isolated areas that it is highly improbable that they should have reached their known localities by ordinary dispersal of seeds and spores from one of these areas directly to another. And, in view of the fact above pointed out, of the restriction on adjacent alpine areas of most of our alpine plants to prevailingly potassic, calcareous, or magnesian soils, it is at first difficult to see how these extremely fastidious plants could have grown in close association at the close of the glacial period, as implied by the long-accepted theory of Forbes, which was greatly extended by Darwin, Hooker, Gray, and others.

When, however, we take into account the character of some exceptional stations for these alpine plants at low altitudes or in less pronouncedly cliff- or rock-habitats, we get a clue to the conditions which they presumably found in their poleward march in the wake of the receding ice-sheet. Throughout New England and adjacent Canada and over much of the continent westward and northwestward there are many cold meadows and bogs or muskeags in which the conditions are such as to support many species which abound in alpine

or high-northern regions. In hundreds of bogs of New England and eastern Canada we find a few of the less markedly alpine plants such as *Carex pauciflora, Eriophorum callitrix, Habenaria dilatata, Andromeda glaucophylla, Ledum groenlandicum*, etc., plants which are typical of our sphagnous bogs and of the mountains composed of potassic rocks. Certain bogs and meadows maintain floras of greater variety and of very great interest, especially when we take into account the alpine distribution exhibited by them. Caribou bog, in Crystal, Maine, for instance, has, besides *Drosera linearis, Betula pumila, Lonicera oblongifolia*, and many other plants of unusual occurrence in New England, a few arctic-alpine species:

Eriophorum callitrix (Group I)
Carex vaginata (Group II)
" paupercula, var. irrigua (Groups I & III)
" limosa (Groups I & III)
" pauciflora (Group I)
Tofieldia glutinosa (Group II)
Rhamnus alnifolia (Group II)
Ledum groenlandicum (Groups I & III)
Rhododendron canadense (Group I)
Kalmia angustifolia (Groups I & III)
" polifolia (Groups I & III)
Andromeda glaucophylla (Groups I & III)
Menyanthes trifoliata (Group I)
Lobelia Kalmii (Group II)
Erigeron acris (Group II)

Small bogs at the mouth of the Grand River, Gaspé Co., and similar but larger bogs at the mouth of the Bonaventure River, Bonaventure Co., Quebec, situated in strongly calcareous regions, have a notable series of arctic-alpine plants, of which the following are conspicuous:

Selaginella selaginoides (Groups II & III)
Scirpus pauciflorus (Group II)
" caespitosus (Groups I & III, and rarely II)
Rynchospora capillacea (Group II)
Carex vaginata (Group II)
" paupercula, var. irrigua (Groups I & III)
" limosa (Groups I & III)
Juncus filiformis (Group I)
Tofieldia glutinosa (Group II)
Salix pseudo-myrsinites (Group II)
" balsamifera (Group I)
" pedicellaris (Group I)
Comandra livida (Groups I & III)
Parnassia parviflora (Group II)
Rubus arcticus (Groups I & III)
Potentilla palustris (Group I)
Empetrum nigrum (Groups I & III)
Rhamnus alnifolia (Group II)
Viola nephrophylla (Group II)
Ledum groenlandicum (Groups I & III)
Andromeda glaucophylla (Groups I & III)
Chamaedaphne calyculata (Groups I & III)
Vaccinium canadense (Groups I & III)
" Vitis-Idaea, var. minus (Groups I & III)

Vaccinium Oxycoccus (Groups I & III)
Menyanthes trifoliata (Group I)
Euphrasia latifolia (Group II)
Pinguicula vulgaris (Group II)
Lonicera caerulea, var. villosa (Groups I & III)
Lobelia Kalmii (Group II)

A certain boggy meadow in a sag near the western edge of Table-top Mt. is, perhaps, the most notable of these bog-areas. This particular meadow, which lies southeast of the crest of the limy northwestern escarpment upon whose cliffs are found many of the plants of Group II, is so situated as to receive the drainage from various directions. From the northwest the drainage is directly off the calcareous slope and in part from a granitic slope; from the southwest comes a general seepage from a small area of serpentine; and from the southward the drainage is off the edge of the great granitic tableland. On account of the strong contrast between the flora of this small meadow and the extensive meadows of the strictly granitic district, the area was designated by Professor Collins and the writer "the Calcareous Meadow," and it has been so indicated upon many herbarium labels. Yet the flora of this notable meadow contains many plants besides those of the calcareous alpine cliffs. The detailed list of alpine plants there recorded includes the following:

Selaginella selaginoides (Groups II & III)
Polystichum Lonchitis (Group II)
Phleum alpinum (Groups I & II)
Agrostis borealis (Groups I, II, & III)
Deschampsia atropurpurea (Group I)
Danthonia intermedia (Group III)
Scirpus caespitosus (Groups, I, II, & III)
Carex stellulata (Group I)
" deflexa (Group I)
" capillaris, var. elongata (Group II)
" atrata, var. ovata (Groups I, II, & III)
Juncus castaneus (Group II)
Habenaria dilatata (Groups I & III)
Salix vestita (Group II)
" Barclayi (Group II)
" pseudo-myrsinites (Group II)
" argyrocarpa (Group I)
" glauca (Group II)
" phylicifolia (Group I)
Betula glandulosa (Groups I & III)
Alnus crispa (Groups I & II)
Comandra livida (Groups I & III)
Anemone parviflora (Group II)
Arabis alpina (Group II)
Rubus arcticus (Groups I & III)
" triflorus (Groups I, II, & III)
Pyrola grandiflora (Group II)
Phyllodoce caerulea (Groups I & III)
Vaccinium uliginosum (Groups I & III)
" caespitosum (Group I and rarely II)
" ovalifolium (Group I)
Veronica alpina, var. unalaschcensis (Group I)
Castilleja pallida, var. septentrionalis (Groups I, II, & III)
Rhinanthus oblongifolius (Group I)
Viburnum pauciflorum (Groups I, II, & III)
Lonicera caerulea, var. villosa (Groups I & III)
Valeriana sylvatica (Group II)

Solidago multiradiata (Groups II & III)
Aster foliaceus (Group III)
Erigeron hyssopifolius (Group II)
Gnaphalium norvegicum (Group I)
Achillea borealis (Groups II & III)
Petasites trigonophylla (Group I)
Arnica mollis (Groups I & II)
Senecio pauciflorus (Group II)
Cirsium muticum, var. monticola (Group III)
Taraxacum ceratophorum (Group II)
Prenanthes trifoliolata, var. nana (Groups I & III)

On these bogs and meadows, it will be noticed, there is a decided mingling of the plants which on alpine rocky slopes or on cliffs are rarely if ever found associated.

Similarly, in the valleys of rivers flowing from our higher mountain areas fragments or seeds of alpine plants are washed down to the bottom-lands where there results a mingling of the plants which are ordinarily confined to distinct areas and soils. Thus, along the River Ste. Anne des Monts, which receives much of the drainage from Mt. Albert, Table-top, and the adjacent mountains, we find, on the broad alluvial "flats" which are submerged during the freshet periods, such plants as *Vaccinium ovalifolium* (Group I), *V. Vitis-Idaea*, var. *minus* (Groups I & III), *Lychnis alpina* (Group III), *Epilobium alpinum* (Group I), and *Deschampsia caespitosa*, var. *alpina* (Group III) growing side by side and in equal luxuriance with *Arabis alpina*, *Dryas Drummondii*, *Erigeron hyssopifolius*, *Senecio discoideus*, *Taraxacum ceratophorum*, and other plants which in their rock-habitats are confined primarily to areas of Group II.

These series of habitats, the meadows, bogs, and alluvial plains, are alike, it will be seen, in having an extremely fine and mixed soil, often derived from rocks of very different kinds; and it is, apparently, the availability in these soils of the potassium, calcium, and often the magnesium, which makes it possible for plants, which in less favored soils are restricted to rocks high in one or another of these elements, to grow side by side on the bogs, meadows, and alluvial plains. Now, if we consider the condition of much of the northern hemisphere during the period when the great ice-sheet was receding and the arctic and subarctic plants were following in its wake, we shall see that there were, in America for instance, measureless stretches of country, from Long Island Sound northward, westward and northwestward and again on the western slopes of the continent, which were essentially identical in their character with the bogs and meadows above referred to, while there also abounded far greater deposits

of mixed and water-worn "till" than now cover large portions of our region. On these vast areas of fine and mixed soils nearly if not quite all the polar and boreal species could find the food-element or the combinations of elements upon which they most depended. For, even if the newly deposited soil in a given region were derived primarily from a single rock or from two rocks, a limestone and a serpentine for instance, it would require the presence in the region of only a very small quantity of another rock, a potassic feldspar for example, to support during their northward march the plants which require a potassic soil, as well as those which depend upon an abundance of calcium or magnesium. A very vivid illustration of this fact is contained in a recent paper by Mr. Allerton S. Cushman on "The Use of Feldspathic Rocks as Fertilizers."[1] Mr. Cushman says:

"Grinding is making surface, and it can be shown that the availability of potash in ground feldspar increases with the surface area. If feldspar is ground so that it will pass an 80–mesh sieve, it will of course contain a certain proportion of very fine particles, some of which approach the limits of visibility under a powerful microscope. If we carry on the grinding of the material from 80-mesh to 200-mesh, the proportion of the very small particles is enormously increased. The smallest particles which we need to consider here are those which can be measured by a micrometer device connected with the microscope. These smallest particles have a diameter of about 0.0001 millimeter. Now, in order to make a specific example, we will consider the surface areas presented by 1 pound of feldspar in different degrees of subdivision. First, in the form of a solid cube, then broken down to particles that could just pass an 80- and a 200-mesh sieve, respectively, and, finally, in the condition it would be if it were possible to grind all the material as fine as the finest particles which occur in an ordinary 200-mesh powder. The 1 pound of feldspar in a solid cube would have a surface area of 29.3 square inches; particles capable of passing an 80-mesh seive would give 8,870 square inches; particles able to pass a 200-mesh sieve would give 24,905 square inches; and if it were possible to reduce the powder to particles 0.0001 millimeter in diameter, there would result a surface area of 16,460,000 square inches.

If it were practically possible to collect 1 ton of feldspar all in the

[1] U. S. Dept. Agric., Bur. Pl. Ind., Bull. no. 104 (1907).

state of the finest particles, as shown above, the surface-area presented by the ton would be enormous—in fact, it would be equal to 256,000,000 square feet, 5,877 acres, or more than 9 square miles." [1]

It is quite conceivable, then, that the polar plants, which had been forced to find temporary homes on the potassic, calcareous, or magnesian areas or the mixed soils of our more southern states and in Mexico, found in the extensive alluvial deposits, which, after the receding of the ice, covered much of the northern half of our continent, a mixed soil in which they were able to spread both eastward and westward as well as poleward; and then, as the particular soil-element upon which they most depended gradually became exhausted from the mixed soil and as the climate at low altitudes became increasingly warmer, these plants found upon bogs, cold meadows or sheltered alluvial shores, or upon cold cliffs and exposed mountain summits, the only habitats in which they have been able to persist within our temperate regions.

In areas of conglomerate rocks, it should be added, as for instance on some of the conglomerate cliffs along the lower St. Lawrence, where the component pebbles are of varied origin (limestones, serpentine, feldspathic rocks, etc.), there is sometimes a mixture of floras similar to that found on the bogs or meadows, and such plants as *Empetrum* and *Hedysarum* or *Zygadenus* will be found occasionally on the same cliffs. In such mixed areas it is, of course, difficult without actual examination of the soil and analyses of the ash of the plants, such as are now being made by Mr. H. H. Bartlett, to determine the controlling soil-elements.

Similarly, in the mixed soils which cover the ordinarily tillable districts of our northern states and Canada the problem is complicated, and in these temperate areas the preference of certain plants for one soil or another is best seen in rock- and cliff-habitats. There is need of close observations along these lines, and, although, in the alpine and subalpine areas here chiefly considered, the distribution of plants is largely controlled by the preponderance in the soil of potassium, calcium and magnesium, it will be found that in various areas, sodium, iron, and other elements are of equal importance in determining the ranges of our plants.

[1] Cushman, l. c. 27, 28.

PERIDERMIUM PYRIFORME AND ITS PROBABLE ALTERNATE HOST.

J. C. ARTHUR.

EARLY in June of this year I received from Dr. Charles Thom a specimen of *Peridermium pyriforme* Peck, collected near Storrs, Conn., on branches of *Pinus rigida* Mill. This is a species rarely seen, only three previous collections being known,[1] and its discovery in a locality where it can be under observation and study is a matter of interest. The species forms numerous and conspicuous aecia on the smaller branches, bursting out through the bark, and showing as large white peridia filled with orange spores. The affected branches are not much swollen by the fungus, and are usually small, less than 2.5 cm., rarely up to 5 cm. in diameter.

So far as known, all species of *Peridermium* on the bark of pines are the aecial stages of corresponding forms of *Cronartium*. Upon the receipt of Dr. Thom's collection the question of the probable telial host presented itself. In the eastern United States only two species of *Cronartium* have so far been recognized: *C. Quercus* (Brond.) Schroet., and *C. Comptoniae* Arth. In the same general region there are also two bark forms of *Peridermium* on pine: *P. Cerebrum* Peck, and *P. pyriforme* Peck. It has been proven by means of cultures, performed independently by Dr. C. L. Shear and the writer, that *P. Cerebrum* is the aecial stage of *C. Quercus*, and it was a simple inference that *P. pyriforme* doubtless belongs to *C. Comptoniae*.

While this information was being communicated to Dr. Thom, the spores which he had sent, and which were not yet dry, were sown on *Myrica cerifera*, a plant of *Comptonia* in good growing condition not being available at the time. No infection was obtained by this sowing. This negative result is without much significance, however, as no examination was made to see if the spores germinated.

The next observations on the rust in the field were made July 5, when Dr. Thom found *Comptonia peregrina*, growing "all around the bases" of the affected pine trees, showing abundance of the characteristic uredinia of *Cronartium Comptoniae*. The spores of the *Peridermium*

[1] See Bull. Torrey Club xxxiii. 420 (1906), where the history of these collections is given.

had now largely disappeared. Both at this time and at the earlier visit on June 4 no examples of the *Peridermium* were found more than 3 dm. above the ground, and the infection was mostly on very small trees, or on small branches near the ground.

The three previous collections of this *Peridermium* were also on small branches. Two of them were made by Mr. J. B. Ellis at Newfield, N. J., one in 1882 on *Pinus virginiana* Mill., distributed in his N. Am. Fungi *no.* 1021, and the other in 1890 on *P. rigida* Mill. The third collection has little import, as it was made in the Missouri Botanical Garden, and if it really belongs to this species, was doubtless brought to the Garden on plants obtained in the eastern states. The rust on *Comptonia* is common in the region about Newfield, N. J.

Of the common forms of *Aecidium* and *Roestelia* many have been definitely associated with their corresponding telial forms. But of the twenty-seven known species of *Peridermium* in North America, which number doubtless represents not more than half the full number that exists, only three have yet been connected by cultures with their telial forms, hence one element of interest in the observations of Dr. Thom. The publication of this note is intended to supply the clue to any one who may be fortunately situated, and inclined to undertake cultures of this rust, which can best be made during the month of May.

PURDUE UNIVERSITY, Lafayette, Indiana.

THE RECORD OF COLOR VARIETIES OF GRATIOLA AT WESTFIELD, A CLERICAL ERROR.— On page 123 of the current volume of RHODORA it was stated that the white and light yellow forms of *Gratiola aurea* had been found at Westfield, Massachusetts. Miss Emily F. Fletcher has called our attention to the fact that this was probably a clerical error and that the station where the plants were found was in reality Westford, which is in Middlesex County, and not Westfield as stated. Reference to Dame & Collins's Flora of Middlesex County, Massachusetts, shows that Miss Fletcher is quite right and that in fact the station was Westford and not Westfield as quoted through some oversight.—ED.

A PINK-PETALED FORM OF CLETHRA ALNIFOLIA.— Several years ago I found on the edge of Watuppa Lake, Fall River, Massa-

chusetts, one bush of *Clethra alnifolia* with pink petals. It was growing in company with a dozen or more bushes of the same species which had the ordinary white petals. Every year since it was first observed the pink-flowered individual has blossomed true to its color. Some seasons it has been badly killed back by the winter; but in all cases shoots from the root have exhibited the pink petals when they have flowered. Finding in the botanical works accessible to me no mention of a pink-flowered variety of this species I sent specimens to the Gray Herbarium where further literature was consulted but no reference to this variation of color was found. As most, if not all, works on our flora, which mention *Clethra*, state that its flowers are white, it seems worth while to put on record this attractive exception.— LOUISE HOLMES HANDY, Fall River, Massachusetts.

THE BULLETIN OF THE JOSSELYN BOTANICAL SOCIETY OF MAINE.— At the thirteenth annual meeting of the Josselyn Society, held at Oxford, Maine, from the 2nd to the 5th of July, the committee on publications reported as follows: "Recommended, that the Society issue a sheet called the Bulletin of the Josselyn Botanical Society of Maine; that the frequency of its issue be determined by the publication committee; that the publication contain an abstract of the minutes of the Society, with a list of the plants collected or identified at the meeting, and such other matter of interest as the committee shall determine." After due consideration this recommendation was adopted and as a result the first number of the Bulletin has been prepared and issued by Dr. Dana W. Fellows and Messrs. Clarence H. Knowlton and Edward B. Chamberlain, who constitute the present publication committee of the society. The paper is a twenty-four page octavo, prepared with evident care and including, besides detailed reports of the proceedings of the society during its thirteenth meeting, a list compiled by Mr. Chamberlain of the flowering plants and pteridophytes collected or observed by the society during its excursions in the towns of Oxford, Otisfield, and Norway, Maine. Copies of the Bulletin, at ten cents each, can be obtained of Mr. Edward B. Chamberlain, Cumberland Center, Maine.

Vol. 9, No. 104, including pages 125–148 was issued 31 August, 1907.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

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SOME NEW GREEN ALGAE.

F. S. Collins.

(Plate 76.)

The species here noted are only in part from New England localities, but so general is the distribution of plants of this class, that the mere accident of locality of the original station is of little importance; any species of the genera in question is liable to be found in any temperate region.

Pleurococcus marinus n. sp. Cellulis sphaericis, 10–40 μ diam. cum membrana cellulari; membrana 2 μ crassa; colore variante ab auriantiaco intenso ad viridem chlorophyllaceam veram; Reproductione per aplanosporas divisione repitita formatas, 8–64 in cellula; membrana cellulari distincta et admodum crassa dum in cellula matricali; congerie sporarum substantia gelatinosa inclusa, post solutionem cellulae matricalis formam sphaericam diu servante.

Cells spherical, 10–40 μ diam., including cell wall; wall about 2 μ thick; color from deep orange to true chlorophyll green. Reproduction by aplanospores, formed by repeated division, 8–64 in a cell, spore wall distinct and relatively thick while still in the mother cell; mass of spores retaining the spherical form and held in a gelatinous mass long after the disappearance of the mother cell wall.

This plant was distributed through a mass of floating algae in shallow pools in a salt marsh at Stover's Point, Harpswell, Maine, July, 1906. It formed so large a proportion of the mass as to give a brick- or orange-red color to the whole, the other species being *Lyngbya aestuarii* (Mert.) Liebm., *Cladophora expansa* Kütz., and other forms usually found in such localities. It has been distributed as No. 1316 of the Phycotheca Boreali-Americana. The genus *Palmellococcus* was founded by Chodat in 1894,[1] for the single species

[1] Chodat, Materiaux pour servir à l'histoire des Protococcoïdées. Bull. Herb. Boissier, Vol. II, p. 429, 599.

P. miniatus (*Protococcus miniatus* Kütz., *Pleurococcus miniatus* Näg.), which is not uncommon on walls and windows of greenhouses, but whose native habitat is unknown; Chodat reports its reproduction under ordinary circumstances to be by bipartition, rarely quadripartition of the cell; but in culture in pure spring water the contents of a cell is by repeated division sometimes transformed into 16, 32 or 64 spores with delicate membrane, escaping in a mass with a gelatinous envelop. This latter form of reproduction is the only one observed in *P. marinus*, but practically all of the Harpswell material seemed to be in some stage of this process. The color of the cell ranges from deep orange to pure green; the largest cells were green, but cells of this color were found of all sizes down to the smallest. The only distinction other than color was that the largest green cells had a thinner wall than the small or moderate sized cells, either green or orange, and that the colored cells seemed more active in spore formation. The wall of the spore was fully developed while the wall of the mother cell was still perfect; after the disappearance of the latter the spores remained in a spherical gelatinous mass for a long time, until they had increased very materially in size; colonies of 32 cells were observed, retaining the spherical form with a diameter of 100 μ. Some of the plant was kept alive for several weeks, but not under the normal conditions of a salt marsh pool; in this material were finally found numerous spherical colonies, in which the contents of each cell had divided into aplanospores of a second generation, much smaller than any noticed in the normal condition of the plant. From *P. miniatus*, *P. marinus* is distinguished by the larger cells, those of *P. miniatus* being 3–15 μ diam.; by the thicker walls of the aplanospores, and by the totally different habitat. According to the figures of *P. miniatus* in Chodat's Algues Vertes de la Suisse, fig. 80, the gelatinous vesicle of the spores is less regular in form in that species and less persistent.

Chaetomorpha Chelonum n. sp. Filamento erecto, stricto, 12–20 μ diam. ad basin, superne incrassato, usque ad 35 μ in fronde sterili; cellula basali ad 1 mm. longa, cellula proxima ad 10 diam., cellulis superioribus 2–3 diam. longis; membrana cellulari crassa; cellulis fertilibus in parte superiori filamenti ortis, ad 50 μ diam., 1–4 diam. longis, leviter aut admodum moniliformibus aut enim subglobosis; zoosporis per aperturam in media parte cellulae et tubum tenuissimum exeuntibus; ramis pluricellularibus, coralloideis, e cellula basali exeuntibus, stratum basale continuum substrato arctissime adhaerentem formantibus.

Filaments erect, straight, 12–20 μ diam. at base, increasing in size upwards, to 35 μ in the upper part of the vegetative plant; lower cell up to 1 mm. long, next cell up to 10 diam. long, upper cells 2–3 diam.; walls thick; fertile cells in upper part of the filament, up to 50 μ diam., 1–4 diam. long, from slightly moniliform to nearly globular; zoospores escaping by an opening near the middle of the cell, through a very short tube; basal layer a dense mass of very irregular, pluricellular, coralloid branches, forming a dense and continuous expansion on the substratum. On the backs of the turtles, *Chrysemys marginata* and *Aromochelys odorata*, Walnut Lake, Oakland County, Michigan, *Dr. T. L. Hankinson.*

Species of *Chaetomorpha* are abundant in all seas, but very unusual in fresh water, the only species which can be considered as well known being *C. Herbipolenis* Lagerh.,[1] which was found in a hothouse in a botanical garden, the place of its origin being unknown. *C. Henningsii* Richter [2] occurring in fresh water near Berlin, is uncomfortably near the marine *C. aerea*, which is said to be found occasionally in fresh water. The present species seems to be amply distinct from *C. Herbipolensis*, by the smaller diameter, longer basal cell, and especially by the strongly developed basal layer, that of *C. Herbipolensis* being merely an outgrowth from the membrane, while in the present species there are distinctly branching, pluricellular filaments, which unite to form a practically continuous layer on the substratum, the shell of the turtle. The basal developments of the individual plants are so closely united that the appearance is that of a continuous membrane, from which arise numerous erect, bright green, straight filaments, pretty uniformly increasing in size from the base to the apex. The cell wall is thick, in the lower cell about one quarter the diameter; the cells in the vegetative filaments are nearly cylindrical, but the fertile cells are strongly swollen, sometimes nearly globular. The material examined having been preserved in formalin, nothing can be said as to the finer details of the zoospores, but evidently large numbers are formed in a cell. Emptied cells showed plainly an aperture near the middle, the cell wall extending as a very short tube, much like that shown for *C. Herbipolensis*, Pl. IX, fig. 5. Two lots of material were received from Dr. Hankinson, one having grown on *Chrysemys*, the other on *Aromachys*; there was some difference between the two, the former having basal cells longer and more slender than the latter, and fertile cells more distinctly swollen.

[1] G. Lagerheim, Ueber die Süsswasser-Arten der Gattung Chaetomorpha Kütz. Ber. Deutsch. Bot. Ges., Vol. V, p. 185, 1887.

[2] P. Richter, Hedwigia, Vol. p. 70, 1893.

Lagerheim, l. c., p. 201, suggests that fresh water *Chaetomorpha* species should be expected in the United States, especially in Massachusetts, as the algal flora here has an almost tropical character. This characterization, which hardly seems to harmonize with the weather of the past winter and spring, was based on his inspection of desmids from Tewksbury. The occurrence of a fresh water *Chaetomorpha*, even farther north than Tewksbury, is of interest.

Cladophora (Aegagropila) amphibia n. sp. Filamentis inferioribus contortis; cellulis forma et magnitudine inaequalibus, subcylindricis, 2–5 diam. longis, 40–70 μ diam., aut 1–2 diam. longis, ad 100 μ diam. in parte media incrassatis; filamentis abunde et irregulariter ramosis, ramis similibus, filamentis ramos erectos etiam gerentibus, 30–50 μ diam., cellulis 4–8 diam. longis, subcylindricis at plus minusve irregularibus, paucos ramulos breves patentes emittentibus; cellula terminali obtusa vel truncata; rhizoidis incoloribus interdum a cellulis inferioribus ortis.

Lower filaments contorted, cells of irregular form and size, subcylindrical, 2–5 diam. long, 40–70 μ diam., or 1–2 diam. long, swollen to 100 μ diam. in the middle, freely and irregularly branched, branches of similar character; also bearing erect branches, 30–50 μ diam., cells 4–8 diam. long, subcylindrical but somewhat irregular, bearing a few mostly short and patent branches; terminal cells obtuse or truncate; slender colorless rhizoids occasionally produced from the lower cells. On damp ground, among *Salicornia*, in a salt marsh, Alameda, California, Sept. 26, 1903, *W. J. V. Osterhout & N. L. Gardner*. Distributed as P. B.–A., No. 1284.

This plant forms a thin extended layer on ground covered only at the highest tides, and has the habit of a *Vaucheria*. The lower part is densely matted, the upper surface is formed by the free ends of the erect branches. These erect branches are fairly regular in form, varying from a true cylindrical shape about as do the filaments of a *Rhizoclonium*; the basal filaments, however, are very irregular, the cells varying from long and cylindrical to short and ovoid, or of a triangular section, the latter apparently where a branch is starting from a short cell; cells of larger and smaller diameters may alternate, or there may be a series of swollen cells, giving a moniliform appearance. Some of the filaments end in a large, ovoid cell, others taper to a slender, tortuous rhizoid. In many cases the first cross wall in a branch is quite a distance from the base, reminding one of *Siphonocladus*. The cell wall is quite thick; the color is a dull green. Although observed by Dr. Gardner for a long time, no indication of spores was seen.

Vaucheria longipes n. sp. Filamentis 80–90 μ diam., sparse et irregulariter ramosis; ramo sporifero, 30–40 μ diam., sub angulo recto exeunte, 1–6 mm. longo, antheridium terminale, cylindricum aut paulo attenuatum, hamatum vel circinatum sustinente; oogoniis 2–4, ovoideis, subobliquis, pedicellatis, 70–85 × 35–40 μ, antheridium superantibus; rostro 15 μ longo; pedicellis 100–150 μ longis, 20–30 μ diam., sub antheridio ortis.

Filaments 80–90 μ diam., oogonia and antheridia borne at the end of a branch 1–6 mm. long, 30–40 μ diam.; antheridium terminal, cylindrical or slightly tapering, hooked or circinate; oogonia 2–4, ovoid, somewhat oblique, pedicelled, 70–85 × 35–40 μ, usually surpassing the antheridium; pedicels 100–150 μ long, 20–30 μ diam., arising just below the antheridium; beak 15 μ long. In a ditch by the roadside, Ross Valley, California, Jan., 1904. *N. L. Gardner.*

Somewhat resembling *V. geminata*, but distinct by the very long fruiting branches, at right angles to the filaments, as well as by the more elongate oogonia, borne on longer pedicels.

V. Gardneri n. sp. Filamentis 50–70 μ diam., sparse ramosis, ramis sub angulo recto exeuntibus, non attenuatis; chromatophoris parvis; antheridiis plerumque solitariis, raro 2–4, et oogoniis 2–4, raro pluribus, pedicellatis, pedicellis basi connatis, 60–100 μ longis, 15–20 μ diam.; antheridii pedicello angulo recto vel subrecto posito; pedicellis oogoniorum circumcirca positis, sub angulo 45° exeuntibus; antheridio hamato vel circinato, ad 10 μ diam. attenuato; oogoniis plerumque sat obliquis, saepe introrsum concavis, 85–95 × 70–75 μ; plerumque antheridium superantibus; rostro circa 15 μ longo.

Filaments 50–70 μ diam., sparingly branched, branches issuing at a right angle, not tapering; chromatophores small; antheridia generally single, rarely 2–4; oogonia 2–4, rarely more; both pedicelled, pedicels connate at the base, 60–100 μ long, 15–20 μ diam.; pedicel of the antheridium at a right angle or nearly so; pedicels of the oogonia arranged around it at an angle of about 45°; antheridium hooked or circinate, tapering to 10 μ diam.; oogonia usually quite oblique, often concave on the inside, 85–95 × 70–75 μ; generally surpassing the antheridium; beak about 15 μ long. In a small pool, Mountain View Cemetery, Oakland, California, May 6, 1903; in a ditch by the roadside, Berkeley, California, April 15, 1905. *N. L. Gardner.* Distributed as P. B.–A., No. 1288.

Forma **tenuis** n. forma. Filamentis 30–40 μ diam.; oogoniis et antheridiis ut apud formam typicam, sed numeris variantibus; antheridiis haud infrequenter 2, oogoniis 1–5.

Filaments 30–40 μ diam., oogonia and antheridia as in the type, but in varying numbers; antheridia not infrequently 2, oogonia 1–5. In company with *V. longipes.*

This species is not unlike *V. longipes*, but the pedicels bearing the

organs of fructification are placed directly on the filament, radiating from one spot; the oogonia are much more oblique, often concave inside. When there are two oogonia and one antheridium, there is a certain resemblance to *V. geminata*; but the slender radiate pedicels make it amply distinct; the forms with many oogonia and antheridia are quite unlike anything else. The largest number of pedicels observed in one group is twelve; four bearing antheridia, eight oogonia.

Malden, Massachusetts.

Explanation of Plate 76.

Fig. 1, Vaucheria longipes.
Fig. 2, V. Gardneri, group of four oogonia and one antheridium.
Fig. 3, " " group of two " " " "

THREE PLANTS FROM MAINE.

Ora W. Knight.

During the fall of 1906 while collecting along the shore near Otter Cliffs, Mount Desert Island, I found a very peculiar form of *Juniperus horizontalis* Moench, with lobed fruit, growing in an extensive patch by itself, while elsewhere the typical plant prevailed. As this plant seems worthy of a name I propose to call it:—

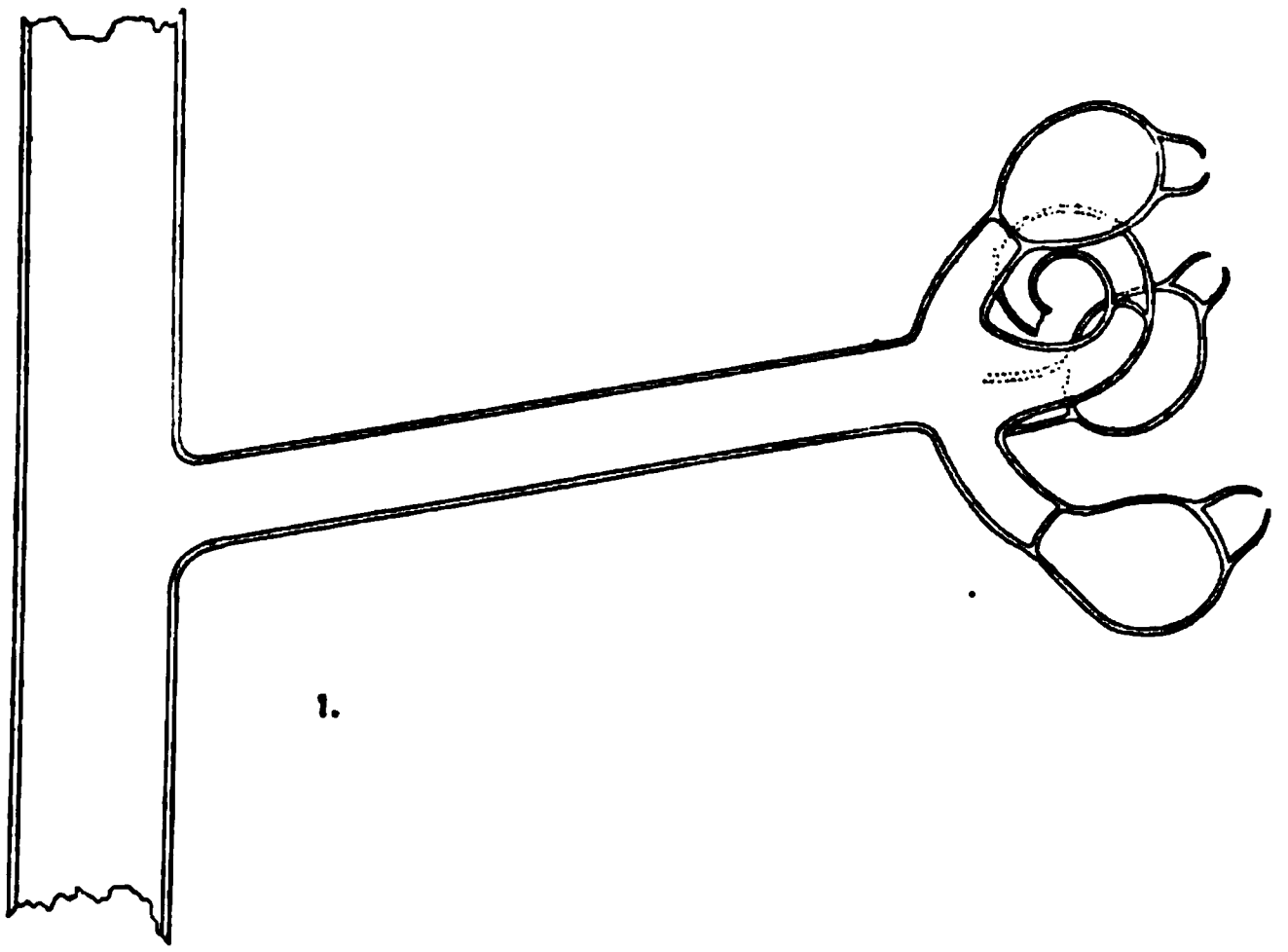
Juniperus horizontalis Moench, forma **lobata**, forma nov.

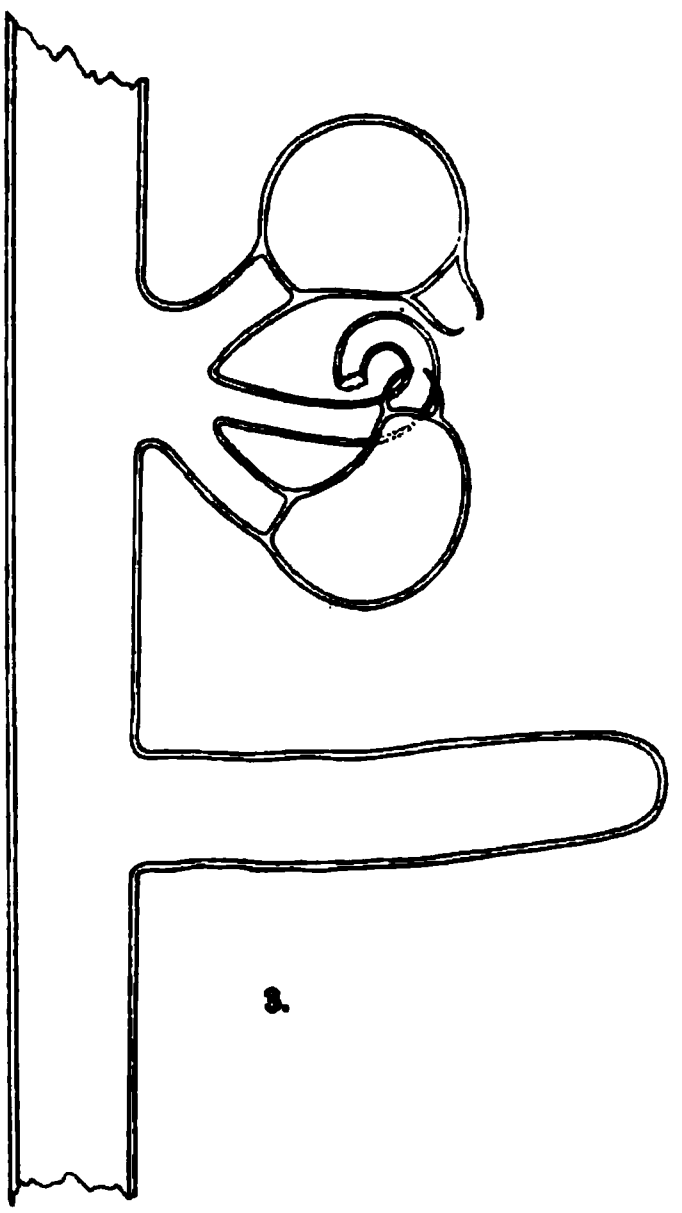
Characters:— differs from *J. horizontalis* in having more elongate fruit which is strongly two-, three- or even four-lobed at the apex. The fruit when mature is pale green in color, slightly tinged with bluish, or occasionally pale greenish blue. Type locality: rocky cliffs along shore, Otter Cliffs, Mount Desert Island, Maine. Type No. 5311 O. W. K., October 3, 1906.

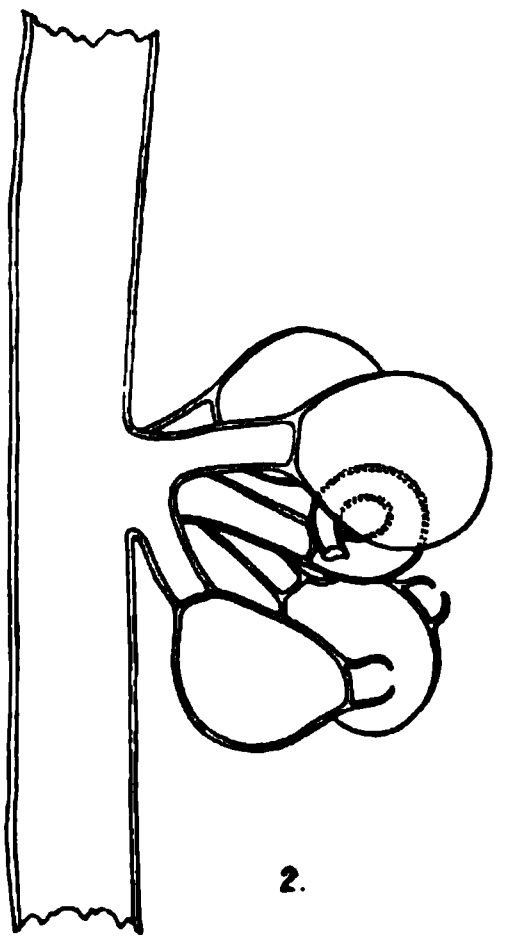
For two seasons I have had under observation a very peculiar hybrid *Pyrus* whose exact affinities were open to some slight doubt at first, but as the question now seems satisfactorily settled I propose to call it:—

Pyrus Americana × arbutifolia, comb. nov.[1]

[1] [Hybrids ascribed to the same parentage have been observed in cultivation. See, for example, Schneider, Ill. Handb. d. Lanbholzk. i. 677.— Ed.]







N. L. Gardner ad nat. del.
Redrawn for reproduction by
F. Schuyler Mathews.

Fig. 1. VAUCHERIA LONGIPES. Figs. 2–3. V. GARDNERI.

Shrub about 1 meter tall; foliage very variable, glabrous above, pubescent beneath even when mature; the leaves either simple, oblong-ovate and dentate or entire, or variously lobed, or compound and composed of five to seven oblong-ovate leaflets with margins dentate or entire; peduncles and pedicels pubescent; cymes decompound, fifteen- to thirty-flowered, the flowers not appreciably different from those of *Pyrus Americana* (Marsh.) DC.; fruiting pedicels and young twigs pubescent; mature twigs glabrous, similar in color to those of *Pyrus Americana*; fruit only sparingly maturing, a majority of the blossoms not being fertilized, red, 6 mm. in diameter, not distinguishable externally from that of *Pyrus Americana*; the seeds very abortive, showing no embryos in the case of several examined. Fruit ripe and falling August 12, 1906. Type locality: growing associated with supposed parents, Bicycle Path, Bangor; flowering specimens June 9, 1905; fruit August 12, 1906. Type specimen No. 5224 O. W. K.

Along the shores of the Penobscot at Bangor, growing near the type of *Salix coactilis* Fernald, is a shrub, which at certain stages of growth I have been inclined to refer to *S. coactilis* although later in the season it more nearly resembles *S. cordata* Muhl. After study of this peculiar shrub for several seasons its true affinities seem well established and I propose to call it:—

Salix coactilis × **cordata,** hyb. nov.

Characters:—Shrub about 2 meters tall; branchlets reddish green to blackish and somewhat quadrangular; youngest branchlets gray and pubescent to puberulent; leaves oblong to lance-ovate, long-acuminate, petioled, at first reddish green to red beneath and pubescent, especially on mid-rib and veins, above deeper red, pubescent on the mid-rib at least, becoming green with age but always paler below and remaining pubescent on mid-ribs above and below, in maturity 6 to 12 cm. long, 2 to 4 cm. broad, rather finely and somewhat irregularly glandular-dentate; petioles pubescent even in maturity; stipules semi-ovate, glandular-toothed, persistent on the younger branchlets, 4 to 10 mm. long; aments on short leafy peduncles, expanding with the leaves, in anthesis 1 to 2.5 cm. long, in fruit 2 to 4 cm. long, 7 mm. thick; scales oblong or obovate, blunt at tip, blackish, very pubescent with silky hairs longer than blade; capsule glabrous, conic-subulate, pedicelled, about 3 mm. long, the pedicel about 1 mm. long; style about 1 mm. long; stigma short, two-lobed; capsules generally abor-

tive, but occasionally producing one or two fertile seed. Type locality: bank of Penobscot River, Bangor, May 16 and June 7, 1904. (No. 35 O. W. K. Type). In general appearance the plant is almost exactly intermediate between *S. cordata* and *S. coactilis*, the aments having a marked resemblance to those of *S. cordata*, while in other characters the shrub resembles *S. coactilis*.

Bangor, Maine.

SALICORNIA EUROPAEA AND ITS REPRESENTATIVES IN EASTERN AMERICA.

M. L. Fernald.

The annual Saltwort or Samphire of our salt marshes, which has passed very generally under the name *Salicornia herbacea*, presents, upon the coast of New England and eastern Canada, three strongly marked tendencies to which it is here proposed to call attention. But first we must consider briefly the nomenclatorial status of the species, which has been recently called to mind by Messrs. Britten and Rendle of the British Museum.[1]

Linnaeus, in the first edition of the Species Plantarum (1753), enumerated four species of *Salicornia*, with the first of which alone we are here concerned. This was

"1. SALICORNIA articulis apice crassioribus obtusis. *europaea*.
Mat. med. 8. herbacea.
Salicornia herbacea. *Fl. suec.* 1.
Salicornia annua. *Sauv. monsp.* 7.
Salicornia. *Hort. cliff.* 490. *Roy. lugdb.* 205.
β Salicornia semipervivens. *Sauv. monsp.* 7. fruticosa.
Kali geniculatum majus. *Bauh. pin.* 289.
Habitat in Europæ litoribus maritimis. ♄ ☉
Conferantur annua & sempervirens *utrum specie distincta?*" [2]

In the 2d edition (1763) of the Species, Linnaeus entirely discarded the name *Salicornia europaea* and published the name *S. herbacea* for

[1] Britten & Rendle, Journ. Bot. XLV. 104 (1907).
[2] L. Sp. 3 (1753).

the annual plant, setting off as a distinct species the perennial *S. fruticosa*. Subsequent authors have been inclined to follow the second edition of the Species instead of the first, and to designate the annual plant of both Europe and America as *S. herbacea* L. (1763).

The name *Salicornia europaea*, however, as shown not only by its position on the page but by its italic-type, was intended by Linnaeus, in 1753, to designate a species embracing two variations, one annual and herbaceous, the other evergreen and fruticose; and it must, of course, be retained for at least one of its components, although in 1763 Linnaeus himself discarded the name. In fact, in 1762, one year prior to the publication of the name *Salicornia herbacea*, the annual herbaceous plant was clearly treated by Hudson, in his Flora Anglica, as *S. europaea*, and several forms (including the fruticose plant) were indicated without names. Thus it is doubly certain that the herbaceous plant, clearly defined by Hudson in 1762 as *S. europaea*, should retain that name instead of the later *S. herbacea* of Linnaeus (1763).

The plant which is usually interpreted as typical *Salicornia europaea* (*S. herbacea*) is somewhat bushy-branched, with the ascending simple or commonly forking spikes comparatively slender (1.5–2.5 mm. thick). This plant is common on our Atlantic coast, from eastern New Brunswick to Georgia, and it occurs in alkaline places in the interior of New Brunswick and New York, also on the Pacific coast.

Another plant, differing somewhat from the typical *Salicornia europaea* in having the elongate spikes much thicker (3–4.5 mm. thick) and more commonly simple or subsimple, is represented in the herbaria examined by several sheets from the coast of New Brunswick, Nova Scotia, and New England, and from Salina, New York; and it is apparently of wide distribution. This thick-spiked extreme seems to be the plant described by Koch as *S. herbacea, β pachystachya.*

The third plant is more distinct from the upright bushy-branched *Salicornia europaea*, for its freely-forking branches are very lax and often drooping, the lowermost commonly much elongated and quite prostrate upon the ground. The plant, thus forming closely prostrate or loosely spreading mats, is the characteristic representative of the species about the mouth of the River St. Lawrence, and from there it follows the coastal marshes southward as far as the entrance to the Bay of Fundy. It also occurs in alkaline places in the Saskatchewan region. This plant is identical with much Old World material which is considered without question to be *S. prostrata* Pallas. In its best

development it appears sufficiently distinct from *S. europaea*, but the distinctions seem to be merely habital, and no characters of flower or fruit have been found by which it can be separated from the upright plant.

A fourth plant, known from the Valley of the Red River of the North in Minnesota and Manitoba to central Kansas and the Rocky Mountains, should be watched for in alkaline regions farther east. This is the recently described *Salicornia rubra* Nelson, which resembles typical *S. europaea*, but is easily separated by the shorter joints of the spikes.

The distinctions and nomenclature of these four annual plants with blunt or bluntish inconspicuous scales may be summarized as follows.

* Joints much longer than thick, conspicuously exceeding the middle flower.

S. EUROPAEA L. Erect (1–4.5 dm. high), from simple to freely branched, the *branches ascending*, green, turning red in autumn; scales obscure and very blunt, making a truncate barely emarginate termination of the long joints of the *slender* (1.5–2.5 *mm. thick*) tapering *spikes*; *middle flower* much higher than the lateral ones, *shorter than the joint*; fruit pubescent; seed 1.3–2 mm. long.— Sp. 3 (1753); Huds. Fl. Angl. 1 (1762); Britten & Rendle, Journ. Bot. XLV. 104 (1907). *S. europaea* (*herbacea*) L. Sp. 3 (1753). *S. herbacea* L. Sp. ed. 2, 5 (1763); and most later authors.— Salt marshes of the coast, New Brunswick to Georgia; interior salt springs, etc., New Brunswick and New York; also on the Pacific coast. (Eurasia.)

Var. **pachystachya** (Koch) n. comb. *Spikes much thicker* (3–4.5 *mm. thick*).— *S. herbacea, β pachystachya* Koch, Syn. ed. 2, 693 (1844). — Similar range, less common.

Var. **prostrata** (Pallas) n. comb. *Branches horizontally spreading or drooping*, very soft and lax, the *lowest much elongated and decumbent*; or the whole plant depressed and matted.— *S. prostrata* Pallas, Ill. Pl. 8, t. 3 (1803). *S. herbacea, β prostrata* Moq., Chenop. Enum. 115 (1840).— Brackish or alkaline shores, Lower St. Lawrence River to Washington County, Maine.

* * Joints about as thick as long, scarcely exceeding the middle flower.

S. RUBRA Nelson. Bushy-branched (0.5–2 dm. high), the abundant simple or forking branches ascending, turning red in autumn; scales broadly triangular, blunt or subacute; spikes slender-cylindric (2–3.5 mm. thick), blunt, rather closely jointed; flowers crowded, the middle

one higher than the others and usually reaching the tips of the joints; fruit pubescent; seed 1 mm. long.— Bull. Torr. Bot. Cl. xxvi. 122 (1899).— Low alkaline places, Manitoba and western Minnesota to central Kansas, and westward to the Rocky Mts.

Gray Herbarium.

NOTES ON PLANTS OF CHESTERVILLE, MAINE.

Lillian O. Eaton.

In addition to the interesting plants of Chesterville already reported[1], the following, perhaps worthy of note, have been found in this vicinity, during the past few seasons. The grasses and sedges were collected and determined by Mrs. Agnes Chase of the Department of Agriculture at Washington, in the summer of 1906; the remaining plants, unless otherwise stated, being the collections of the writer. For aid in final identification of various species I am indebted to Dr. D. W. Fellows, Mr. A. A. Eaton, and Professor M. L. Fernald.

Oxalis Acetosella L., var. *subpurpurascens* DC. A few plants of this variety were found in a cedar swamp, among a thick colony of the species, by Mrs. Chase and the writer, July 3, 1906. The variety differed from the typical *O. Acetosella* only in a whitish appearance of the foliage and in the color of the petals, the latter being wholly a purplish-pink. After identifying the plants, Mr. Fernald writes: "I have known this variety in America only from Manchester, Vermont."

Lysimachia thyrsiflora L. Fence-row, in damp soil, July, 1906 (*F. J. Keyes*).

Sabbatia campestris Nutt. A single well flowered plant was found, September, 1906, on ground left fallow for a season.

Spiranthes Romanzoffiana Cham. Roadside ditch, August, 1906. Also found in a field, August 14, 1902, by C. H. Knowlton (See Ames, Orchidaceae, fasc. i. 139).

Scheuchzeria palustris L. Abundant on one bog, August, 1904.

Carex pauciflora Lightf. Plentiful on two bogs, July and August, 1904.

[1] Rhodora, ii. 123; v. 82.

Carex Backii Boott (*C. durifolia* Bailey).
Glyceria nervata Trin., var. *stricta* Scribn.
Panicum Werneri Scribn.
" *tennesseense* Ashe.
Phegopteris hexagonoptera Fée. A large colony on a shaded hillside, July, 1905.
Aspidium spinulosum Swartz (typical). On a rocky hill in partial shade, the plants evidently increasing.

South Chesterville, Maine.

The Dwarf Mistletoe on the Southeastern Coast of Maine. — The recent articles calling attention to *Arceuthobium pusillum* at different points in Maine prompt this note, supplementing the series of Maine records.

The plant first came to my attention during July, 1902, at West Jonesport, occurring rarely on Black Spruce, on the main land. Late in July, 1904, at Cross Island, off the mouth of Machias Bay, the plant was found in great profusion, again on Black Spruce. Here it infested patches of limited extent, with larger patches free from infection.

On Matinicus Island, off the coast of Maine, on August 4th, 1907, this plant was found in greater abundance and size than I have seen it previously. It infested the small, exceedingly dense or "scrubby" White Spruces about the Northwest Head.

I have often looked, vainly, for it about Casco Bay, yet we are now warranted in considering that it has been shown to occur throughout the northern, central, and eastern portions of the State.[1] The regularity of its distribution is another question, deserving of many reports. — Arthur H. Norton, Portland, Me.

[1] The following records are to be found in Rhodora.
Vol. ii. 2 (1900): *von Schrenk* — Monhegan Island, Boothbay, Linekin.
10 (1900): *Fernald* — Fort Kent, Upsala.
221 (1900): *Arthur* — Isle au Haut.
Vol. v. 49 (1903): *Harvey* — Mt. Katahdin.
Vol. viii. 168 (1906): *Chamberlain* — Pleasant Ridge.
Vol. xi. 28 (1907): *Murdoch* — Rangeley.
75 (1907): *Rand* — Mt. Desert Island.
124 (1907): *Chamberlain* — Norway — Casco.
[*Arceuthobium* is also found in Alton and Georgetown — Eds.]

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AN ALPINE VARIETY OF HOUSTONIA CAERULEA.

ARTHUR STANLEY PEASE AND ALBERT HANFORD MOORE.

THE striking white flowers of *Houstonia caerulea* in Tuckerman's Ravine have long attracted the attention of the numerous persons who travel through it every year, whether botanists or not, since these flowers form a very conspicuous part of the flora of the ravine.[1] The beautiful white color of the corolla, and brilliant yellow of the throat and upper part of the tube have for a long time led the authors to wonder if the plant in question might not be distinct from the lowland species. Several collections and a careful study at the Gray Herbarium have confirmed this suspicion.

The variety of Tuckerman's Ravine and the Alpine Garden may be readily distinguished by the color characters above referred to, together with the shape of the corolla tube. In the case of the alpine variety, the tube tapers gradually downward from the limb to the base without any striking differentiation into a broader and narrower portion. In the common variety, on the other hand, there is a long, straight, much more exserted tube, and then an abrupt, but usually narrow, funnel-like broadening just beneath the border. The following measurements, while not practicable for purposes of identification, are interesting evidences of the distinctness of the two phases. A careful series of measurements of the breadth of the corolla-tube at the widest portion, immediately below the limb, and the total length of the tube shows that, while individual measurements in both plants overlap, the averages are quite different. The average width in the mountain variety was found to be 2.04 mm. and the average length 3.41 mm. In the lowland plant these figures were respectively 1.80 and 4.58 mm.

[1] Cf. G. S. Miller in Proc. Bost. Soc. Nat. Hist. xxvi, 178 (Feb. 7, 1894) foot-note, "A very large, pale form, apparently distinct from the lowland plant."

The average ratio in the first instance was .59 and in the second .39. The measurements of the width range from 1.25–3 mm., those of the length from 3–4 mm. for the new variety, but from 1–2.75 mm. and 3–6 mm. respectively for the common variety.

Houstonia caerulea is described by Linnaeus as being blue. The ordinary lowland plant is not infrequently white, and has always a yellow throat, but this feature is not so striking, and it has the customary corolla-tube of the Bluet. It is presumably this phase which is referred to by Millspaugh in Flora of West Virginia, 375 (1892) as *Houstonia caerulea f. albiflora*, but it is listed without description.

The authors take great pleasure in dedicating the variety, whose characterization follows, to the late Edwin Faxon and to Charles Edward Faxon, now connected with the Arnold Arboretum, two brothers, whose collections of the flora of Mount Washington and vicinity have been among the most extensive and valuable in recent years.

HOUSTONIA CAERULEA L. var. **Faxonorum** Pease et Moore var. nov.

Flores candidi, faucibus flavissimis; corollae tubus sensim a limbo usque ad basim constrictus; tubi maxima latitudo 1.25–3 mm. (plerumque 2.04), longitudo 3–4 mm. (plerumque 3.41). Distributio in alpinis Montium Alborum.

Houstonia serpyllifolia Grah. (not Michx.) in Bot. Mag. lv, pl. 2822 (1828). Here the above variety is clearly figured. For an illustration of the type see Bot. Mag. xi, pl. 370 (1797).

Type specimen: NEW HAMPSHIRE, Coös County, Headwall of Tuckerman's Ravine, Sargent's Purchase, July 29, 1907 (*A. H. Moore*, no. 4047 in Herb. Moore. Co-types in Herbb. Gray, Pease, and Bartlett).

Other specimens examined: NEW HAMPSHIRE, Coös County, Headwall of Tuckerman's Ravine, Sargent's Purchase, August 14, 1902 (*A. H. Moore*, no. 291) and August 28, 1907 (*A. S. Pease*, no. 10732); Alpine Garden, Sargent's Purchase, August 19, 1907 (*A. S. Pease*, no. 10558); Mt. Washington, within 2–300 ft. of summit, Sargent's Purchase, August 6, 1897 (*W. Deane*).

CAMBRIDGE, MASSACHUSETTS.

MENDEL'S LAW OF DOMINANCE IN THE HYBRIDS OF VIOLA.

E. Brainerd.

In a recent paper [1] I gave some account of certain experimental cultures of the offspring of violet hybrids. It was shown that these seedlings diverge in a striking manner from the mother plant and from each other, in accordance with the laws of heredity that Mendel found to control the progeny of a hybrid. During the past summer I have been able to trace the operation of these laws in the characters of the petaliferous flowers of these seedlings, and in several cases have raised a second generation of seedlings.

In these experiments it has clearly come to light, that in some particulars at least, Mendel's Law of Dominance finds illustration among violet hybrids. The special instance of this that I wish to present in detail, relates to the inheritance of color of capsules and of seeds in *V. hirsutula* × *papilionacea*, briefly discussed in Rhodora, ix. 93, June 1907.

The putative parents of this hybrid differ from each other as shown in the following table:—

		V. HIRSUTULA	V. PAPILIONACEA
Leaves	habit	nearly prostrate	erect
	width	2–4 cm.	5–10 cm.
	upper surface	hirsutulous	glabrous
	petioles	glabrous	somewhat hairy
Flowers	color	reddish purple	deep violet
	spurred petal	villous	glabrous
Capsules	length	6–8 mm.	10–15 mm.
	color	purple	green
	number of seeds	20–30	50–70
Seeds	length	1.6 mm.	2 mm.
	color	buff	dark brown

The offspring of the hybrid present, in the most varied manner, a redistribution of most of these points of difference. Segregation in leaf characters was especially well marked. The differences in size of capsule and in number of seeds were obscured by the impairment

[1] Read before sections F & G of the A. A. A. S., Dec. 27, 1906, and printed in Science June 14, 1907.

of fertility, which though not as great as in many violet hybrids, was yet in some plants sufficient to make the evidence ambiguous. Attention will be here restricted to the two points of color difference, in which Mendelian dominance is plainly manifest.

In the hybrid from the wild the capsules are a reddish purple, like those of *V. hirsutula*. The tendency to produce the green capsules of the other parent is however present, for it appears in some of the offspring; but in the mother hybrid it is overpowered by the conflicting tendency to produce purple capsules. In Mendel's language, the purple color is 'dominant,' the green color 'recessive.' In like manner it appears that the brown seed-color of *V. papilionacea* is dominant over the buff seed-color of *V. hirsutula*. Mendel represented dominant characters by capital letters, recessive characters by the corresponding small letters. Following his practice, we may let **A** stand for the purple capsule-color, and **a** for the green capsule-color; **B** for the brown seed-color, and **b** for the buff seed-color. One parent, *V. hirsutula*, will then be marked as **A.b**; the other, *V. papilionacea*, as **a.B**; and the hybrid resulting from their sexual union as **Aa.Bb**.

The plants from the wild are presumed to have been the immediate result of the crossing of the two species,— what are technically known as F_1's. It may well be that they are removed one or more generations from the original cross; but this is not of especial importance in the present experiment, as it will be seen that these particular plants, so far at least as respects the two color qualities under investigation, are hybrids of exactly the same status as 'first crosses.'

From the close-fertilized seeds of these plants I raised in 1906 11 offspring, F_2's; and in 1907, 10 offspring; in all, 21. Among these all the four Mendelian forms were found to occur, in number and character as follows:

10	plants	had	purple	capsules	and	brown	seeds,	apparently	**A.B.**
3	"	"	"	"	"	buff	"	"	**A.b.**
5	"	"	green	"	"	brown	"	"	**a.B.**
3	"	"	"	"	"	buff	"		**a.b.**

A close approximation to the theoretically required ratio of '9:3:3:1' is to be expected only when there are several hundred individuals; but even in the small number here shown there is a decided plurality of **A.B's**.

The different forms of these capsules and their seeds are shown in

fig. 1, in which the purple capsules and brown seeds are shaded, and the green capsules and buff seeds are left white.

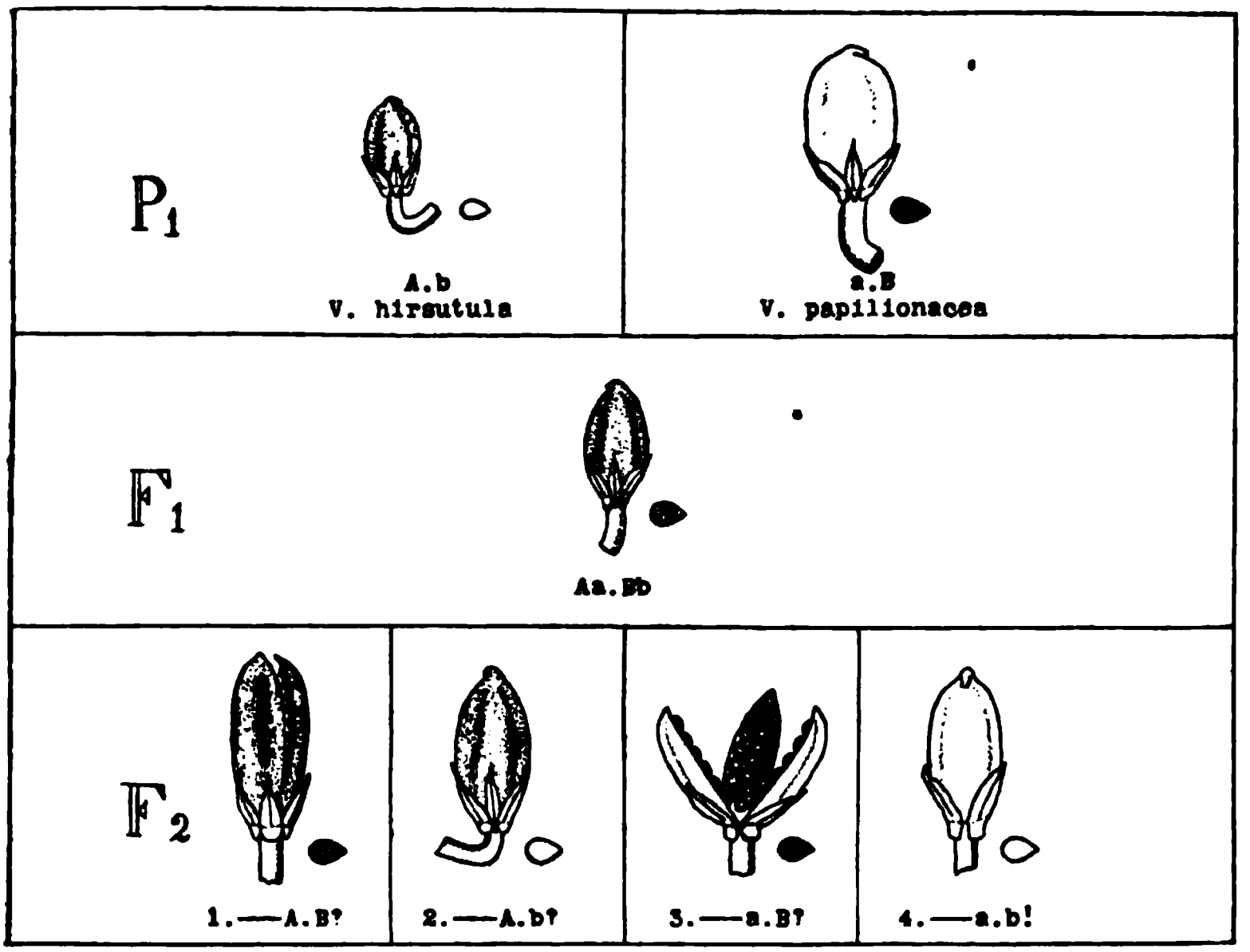

Fig. 1.—Capsules and Seeds of Viola hirsutula × papilionacea, and ot its Parents and Offspring.

In 1907 offspring were obtained of six different plants of the eleven raised in 1906. In order to interpret the results, the reader who is not familiar with the laws of Mendel, will be helped by a brief preliminary discussion of the real nature of the four forms of F_2 that appear as the product of the first sowing. As a matter of fact there are five other forms, that masquerade under one or another of the first three forms shown above. We are not sure, among these, in a plant with purple capsules, but that there is also a latent tendency to produce green capsules, kept in check in this individual plant by the dominance of the purple tendency, but able to assert itself in some of the offspring That is, we do not know whether the **A** is pure **A** or **Aa**. Similarly we are not sure in a plant that bears brown seeds but that there is also a latent tendency to bear buff seeds, repressed in this individual plant by the stronger tendency to bear brown seeds, but able to

assert itself in some of the offspring; **B** may be simply **B** or **Bb**; it may be pure or hybrid. Accordingly, under form 3 above we may have either **a.B.** or **a.Bb**; under form 2 either **A.b** or **Aa.b**; and under form 1 either **A.B**, **A.Bb**, **Aa.B**, or **Aa.Bb**. The fourth form, **a.b**, is without ambiguity. These possibilities are pictured in the following diagram, in which the latent hybridity is represented by small crosses on capsule or seed.

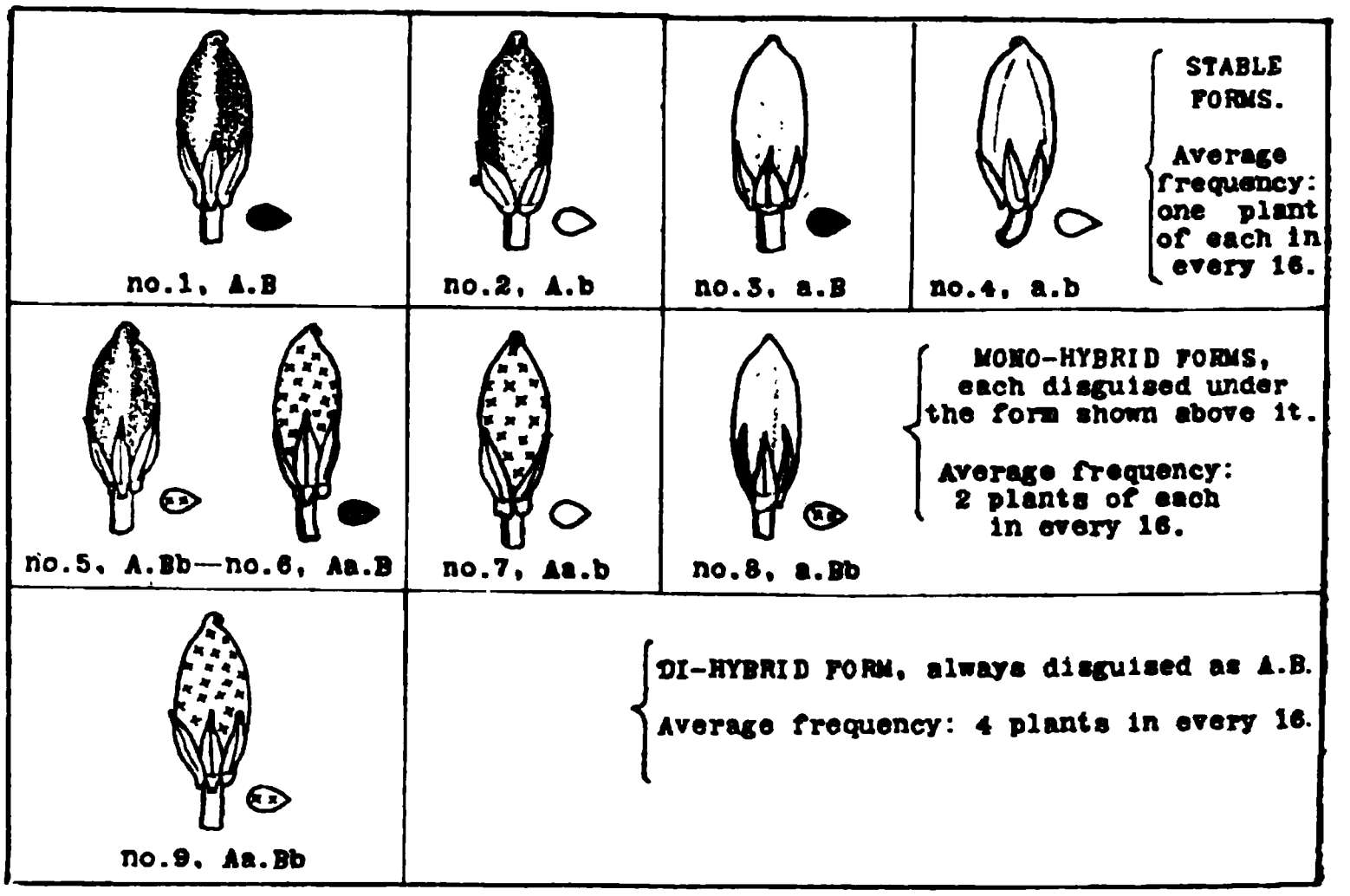

Fig. 2.—Color Forms in Offspring of V. hirsutula × papilionacea.

It will be seen at once that to determine the real nature of any one of the first three of the F_2's in fig. 1, we need to grow its seeds. The apparent forms of the six plants whose seeds were sown, and of their offspring, are given in the following table:

Form of F_2	A.B	A.B	A.B	A.b	a.B	a.b
Seed-number	340	337	339	334	333	338
Forms of F_3 obtained, and the number of plants of each form.	A.B–4	A.B–4				
		A. b–1		A.b–4		
	a.B–2	a.B–3			a.B–6	
			a.b–1			a.b–5

The plants raised from these six sowings were so few (largely from lack of time to transplant) that the numerical results are unimportant;

but in no instance is there a failure to comply with the laws of Mendel. The following points should be noted:—

1. In the sowing numbered 338 all five offspring are like the parent **a.b**,— have green capsules and buff seeds; a recessive character (in this case a double recessive) must always breed true. Here we have a new and stable form, which as a whole is unlike either of the original species.

2. We may infer that the plant from which seeds numbered 333 were obtained was probably pure, that is, was really **a.B** and not **a.Bb**; had it been the latter, one or more of the six offspring would probably have had buff seeds, or been **a.b**. Perhaps as regards capsule-color 334 was also pure,— **A.b** and not **Aa.b**. If so, we should have here in color characters complete reversions to the respective grandparents, *V. papilionacea* and *V. hirsutula*.

3. In sowing 339, though only one seed germinated, it tells the whole story regarding the form of the parent,— it must have been the di-hybrid **Aa.Bb**, and thus exactly like the immediate parent F_1. A plant with purple capsules and brown seeds produces one with green capsules and buff seeds; a feat to be expected of a di-hybrid, though only once in every sixteen plants that it reproduces.

4. The proof is equally clear that in sowing 337 we have the seeds of another di-hybrid; it throws both sorts of capsules and both sorts of seeds.

5. In sowing 340 the result is somewhat ambiguous;— the mother may be either **Aa.Bb** or **Aa.B**; it could not be **A.Bb** or **A.B**.

6. Though three apparent **A.B**'s were sown, none proved to be pure or stable like no. 1 of fig. 2. But in the offspring of a di-hybrid the chances are that only one in nine, that have the form **A.B**, will turn out to be that in reality.

I much regret that the experiment was not conducted on a larger scale; but it should be borne in mind that the object was not to verify the Laws of Mendel,— that is now quite unnecessary; but, conversely to prove that as these seedlings in their metamorphoses obey the laws of Mendel, their parent was of hybrid origin. Disappointed in my expectation that the artificial production of violet hybrids would be attempted at a certain 'biological laboratory,' it occurred to me over two years ago that equally valuable results might be gotten by observing the behavior of the offspring of the supposed

hybrids. As pointed out by Dr. McDougal,[1] the test of a suspected natural hybrid may often be better made by the Method of Analysis than by the Method of Synthesis. In the genus Viola the analytic method has proved unexpectedly successful. Over thirty putative hybrids have produced offspring that segregate in accordance with Mendelian principles.

An objection recently made to the occurrence of hybrids in Viola is based on the supposed fact "that 99 out of 100 seeds of these plants"[2] are from self-fertilized flowers. This led me last June to examine with reference to this matter plants of some eighteen species of our stemless violets, and revealed the fact that all but two of these plants produced seed freely from the petaliferous flowers; in some instances over 300 such seeds were produced by a single plant.[3] The structure of the flower, in style stamens and petals, shows a most ingenious arrangement to prevent self-pollination; and it is now evident that the ovules are readily fertilized by the pollen of an allied species. The coexistence of this habit with the opposite habit of producing in summer self-fertilized flowers is apparently the cause of the multiplicity of forms in this group of plants. Hybridism gives rise to numerous intergradient types; cleistogamy preserves them from further intermixture more skilfully than the artificial hybridizer with his paper bags, and permits the laws of Mendel to work out their natural results, giving rise often to new varieties and races. The behavior of violet hybrids and their offspring under cultivation presents many striking illustrations of this procedure, and awakens the hope that with this clew to guide us we may solve some of the long-standing perplexities of the genus.

MIDDLEBURY, VERMONT.

[1] Hybridization of Wild Plants, Bot. Gazette xliii. 11–44, Jan. 1907.

[2] Prof. E. L. Greene, Leaflets i. 214.

[3] Five plants of *V. nephrophylla* furnished at one time from the capsules of petaliferous flowers 1227 ripe seeds.

PRIMULA FARINOSA, VAR. MACROPODA ON THE MAINE COAST.

JOSEPH A. CUSHMAN.

WHILE I was collecting on the coast of Maine about Machias Bay in early August my attention was called to the occurrence of a peculiar plant said to be found at the base of the lighthouse on Libby Islands. It was thought to have been brought there by birds which frequently fly against the lighthouse and are killed. To see what this plant might be I visited the island with Mr. S. N. F. Sanford and found the plant in very considerable numbers. It proved to be *Primula farinosa* L., var. *macropoda* Fernald. The only places where it occurred were at the base of the lighthouse and the ground about the oil-house nearby. At the time of collecting, the plants were in excellent fruit and certainly seemed thoroughly established. They were growing in loose sandy loam well grassed over. From its appearance it was soil which had been added there by grading and was not in its original position.

From the occurrence of the plants it seemed in every way probable that the seeds were brought, as was first told us, by birds coming from farther north. As is well known, many birds are killed by flying against lighthouses at the various exposed points along the coast. The very limited occurrence about the lighthouse seems to be explained only in this way.

After visiting the island we studied the chart of the region and decided to make a trip to Moose Peak Light on Mistake Island. This is the outer exposed point of the northeastern chain of islands extending out from Jonesport. This was in the direction which birds would probably take in migration. If the theory of the source of the other station was true it seemed as though the plant should be found there also. A day or two later we visited Mistake Island and were much pleased to find the plant there though the individuals were much fewer in number. It was growing near the light on moist granitic cliffs but in considerable soil. On the same day we also landed at Black Head on the outer part of Head Harbor Island. On the summit were found scattered specimens of the same plant. These were growing in wet grassy spots among the rocks and appeared more likely to be indigenous than in either of the other places visited. It was planned to visit Nash Island still farther to the southwest but time and

weather conditions prevented our doing so. In all, three stations were discovered for this plant. These are of especial interest as the only other New England station was Mt. Kineo, Moosehead Lake, Maine. Although I collected on Mt. Kineo about three weeks later and made a point of looking for this plant no trace of it was found but I have since been informed by Dr. Kennedy that his specimens were found at the eastern end of the cliffs at a spot I did not reach.

From our observations it would seem likely that the plant may be found about the lighthouses still farther to the southwest along the outer points of the Maine Coast.

BOSTON SOCIETY OF NATURAL HISTORY.

NOTEWORTHY PLANTS COLLECTED AT ROQUE BLUFFS, MAINE, IN 1907.

C. H. KNOWLTON.

DURING the past summer I spent several days collecting in Washington County, Maine, mostly in the township of Roque Bluffs. This lies on the coast, 16 miles from Cutler, and 22 from Mt. Desert. The summer climate there is cool and very wet, because the Greenland current washes the shore and causes frequent fogs.

The coast is lined with cliffs of volcanic rock, broken by occasional sea-caves, estuaries and beaches. In many places heavy spruce woods come down to the edge of the sea-cliffs, with such typical plants of the northern mountain woods as *Solidago macrophylla*, Pursh, and *Aspidium spinulosum* (O. F. Mueller) Sw. var. *dilatatum* (Hoffm.) Hook. forma *anadenium* B. L. Robinson.

Back from the cliffs are numerous and extensive peat-bogs, covered with *Picea nigra* Link., *Eriophorum callitrix* Chamisso, *Smilacina trifolia* Desf., *Empetrum nigrum* L., *Rubus Chamaemorus* L., *Vaccinium Oxycoccus* L., and more common bog plants.

I have not fully explored the region, and the estuaries in particular will probably reward further search. The following species already collected, however, seem worthy of mention.

Elymus mollis Trin. is a common beach grass, growing in the same sandy soil as *Ammophila arundinacea*, Hostk.,— but not so abundant.

Iris setosa Pall. Very common within reach of spray from the sea, but never competing with *I. versicolor* L., inland.

Comandra livida Richards. Very common on Johnson's Beach bog, with *Rubus Chamaemorus* L., but there were no blossoms or fruit visible (July 6). This is the first New England station at sea level, as the other reports are from five granitic mountain tops (Mansfield, Clinton, Saddleback, Abraham and Katahdin). It occurs at sea level in New Brunswick and northward.

Suaeda Richii Fernald. Common along the edges of the salt marshes.

Montia fontana L. Moist open woods, Roque Island.

Empetrum nigrum, L. var. *andinum* DC. Common on the top of the sea-cliffs, in residual gravel, the branches frequently hanging down. The typical form of the species seems to grow only in peat-moss. (RHODORA, IV, 196.)

BOSTON, MASS.

NOTOTHYLAS ORBICULARIS IN MASSACHUSETTS.— On October 9, 1907, while collecting with a class in Cryptogamic Botany, on the Wellesley College campus, I found a number of plants of *Notothylas orbicularis* (Schwein.) Sulliv. The *Notothylas* was growing on wet sandy soil, in company with *Anthoceros*, and equally abundant. Dr. A. W. Evans has confirmed my identification of the material.

As there seem to be few specimens in herbaria, it may be worth while to record what is known of Massachusetts stations for the plant. Dr. Evans states that the only Massachusetts specimens, of which he knows, were collected at Cambridge, and are in the Underwood Herbarium. There is but one specimen in the Cryptogamic Herbarium of Harvard University, having been collected by Dr. Farlow at Newton, in a locality where now probably extinct. In addition to these specimens, Dr. Evans has found *Notothylas* at Falmouth, Dr. Farlow at Cambridge, and Dr. Thaxter at Waverley. In none of these cases, however, was material preserved. To these should now be added the Wellesley locality. Specimens of this collection have been deposited in the Herbarium of Wellesley College, in the Herbarium of Dr. A. W. Evans, at Yale University, and in the Cryptogamic Herbarium of Harvard University.

The records from the localities named above suggest that *Notothylas* is probably well distributed through Massachusetts and perhaps

further north, but has been overlooked. It, therefore, seemed well to call the attention of New England botanists to the plant, that they may watch for it in future collecting, and give us more exact knowledge of its distribution.—LINCOLN WARE RIDDLE, Wellesley College, Wellesley, Massachusetts.

REDISCOVERY OF PODOSTEMON CERATOPHYLLUS IN VERMONT.—While crossing the West River about one fourth mile below the railroad station in Jamaica, Vermont, one day the past summer, my attention was attracted by a curious sea-weed like plant which adhered closely to the stones of the river bed, and which seemed to be abundant over a considerable area. It being the dry season (August) some stones bearing the plant were out of water. Upon being submitted to the Harvard Botanical Department the plant proved to be the river weed *Podostemon ceratophyllus* Michx. This plant has before been reported from Vermont by Frost but has been placed upon the doubtful list in the Flora of Vermont. The station is only accessible at low water but no doubt the plant may be found at other places in the bed of West River.— FRANK DOBBIN, Shushan, New York.

A NEW VARIETY OF SCIRPUS OLNEYI.— The genus *Scirpus* is somewhat remarkable for the number of its varieties with elongated spikelets, so it was not surprising when, in Milford, Conn., Sept. 28, 1907, during an excursion of the Connecticut Botanical Society, the writer found an additional variety of this class, which may be described as follows:—

SCIRPUS OLNEYI Gray, var. **contortus**, n. var. Some or all of the spikelets twisted or bent, linear, elongated (1–2, rarely 2.4 cm. in length); involucral leaf prolonged (3–7 cm.) and, like the stem, not so stout as in the species. Brackish marsh on the coast, Milford, Conn., *E. H. Eames*, no. 5847. Type, in herb. Eames: co-type in herb. Gray.

Conspicuously different from the species in the foregoing characters; and from allied species, among other features, in the remarkable triquetrous-winged stem.— E. H. EAMES, Bridgeport, Connecticut.

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Rhodora

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THE NEW ENGLAND BOTANICAL CLUB

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SOME NEW WILLOWS OF EASTERN AMERICA.

M. L. Fernald.

Recent explorations of the eastern portion of the Province of Quebec have brought to light many willows which have hitherto been unknown in eastern America. Some of these shrubs, such as *Salix pseudomyrsinites* Anders., *S. Barclayi* Anders., and *S. fuscescens* Anders., have been previously known only from the northwestern Provinces or from Alaska; the unique *S. Richardsoni* Hook., var. *Macouniana* Bebb has been known only from Hudson Bay and northern Labrador; while some others it has been impossible to identify with any described species or varieties.

The most abundant of these undescribed willows are two large shrubs or small trees which abound on the terraces and banks of the St. Lawrence at least from Matane to the River Ste. Anne des Monts, and probably beyond, and for several miles inland in the valley of that river. One of these trees, which in its best development is about 15 feet high, with wide-spreading branches, has the largest leaves known to the writer in any member of the *Diandrae*, the mature blades often reaching a length of 5 or 6 inches. This handsome large species may appropriately be called

Salix **laurentiana** n. sp. Frutex altus vel arbor mediocris, ramis crassis junioribus canescento-tomentosis; foliis oblongis vel oblongo-obovatis acutis vel breviter acuminatis junioribus dense albo-pubescentibus, demum supra glabris viridibus lucidis subtus glaucescentibus 6–14 cm. longis 3–4.5 cm. latis subintegris vel leviter crenatis, petiolis gracilibus circa 1.5 cm. longis tomentosis; stipulis late ovatis deciduis; amentis gracilibus pedunculatis foliis parvis 3–5 suffultis patulis, femineis densifloris fructiferis 4–9 cm. longis 1 cm. crassis; squamis oblongis obtusis fuscis longe pilosis; capsulis conico-subulatis obtusis canescento-tomentosis 5–6 mm. longis pedicellatis, pedi-

cello nectarium triplo superante; stylo brevissimo, stigmatibus bifidis.

Large shrub or small widely branching tree, 2–5 m. high; branchlets coarse, canescent-tomentose, the pubescence slightly lustrous; leaves oblong to oblong-obovate, at first silky-tomentose on both surfaces, in maturity bright green and glabrate above, glabrate and glaucous beneath, 6–14 cm. long, 3–4.5 cm. broad, subentire or shallowly crenate, acute or short-acuminate, rounded at base to the tomentose petiole (about 1.5 cm. long); stipules round-ovate, deciduous; aments borne upon short leafy branches, the pistillate dense, on canescent peduncles, 4–9 cm. long, about 1 cm. thick; scales oblong, obtuse, dark brown, long-pilose; capsule conic-subulate, blunt, canescent-tomentose, 5–6 mm. long; pedicel 1–2 mm. long, thrice as long as the nectary; style 0.5 mm. long, the stigmas deeply cleft.— QUEBEC, abundant on terraces and banks of the St. Lawrence River from Matane, Matane Co., to Ruisseau Castor, Gaspé Co., and probably eastward. Type material: in fruit, Méchins, Gaspé Co., July 12, 1906 (*Fernald & Collins*, no. 202); in mature foliage, calcareous-sandstone sea-cliffs, Tourelle, Gaspé Co., August 19–21, 1905 (*Fernald & Collins*).

A handsome and very characteristic large-leaved shrub or small tree, suggesting in its foliage and tomentose branchlets *S. amplifolia* Coville, of Alaska, which has slightly smaller leaves, no stipules, thicker aments (1.5–2 cm. in thickness), the ovary and capsule smooth, and the style 3–4 mm. long. From the eastern *S. glaucophylla*, which abounds along the rivers of northern Maine, New Brunswick and Quebec, *S. laurentiana* is, likewise, immediately distinguished by its tomentose capsules, as well as the aments terminating leafy twigs instead of being sessile or subsessile upon the old wood.

The other undescribed willow which is associated on the banks of the lower St. Lawrence with *S. laurentiana*, *S. pellita* Anders., *S. lucida*, var. *intonsa* Fernald, and *S. rostrata* Richardson, has a wider distribution than *S. laurentiana*, for it has been observed in abundance up the river from Matane as far as St. Fabien in Rimouski County and it doubtless extends further west. This large shrub or small tree, sometimes 20 feet high with trunks 6 inches in diameter, is clearly an extreme variation of the common *S. rostrata*. In the typical form of the species as well as in such variations as I find described the leaves are more or less rugose and comparatively small, the mature pedicels are from 3 to 5 mm. long, and the capsules 5 to 9 mm. long. The larger extreme of the species from the lower St. Lawrence may be called

SALIX ROSTRATA Richardson, var. **luxurians** n. var. Arbor 2–6 m. alta, trunce 1–1.5 dm. crasso; foliis planis non rugosis 6–10 cm. longis; amentis femineis 2.5–3 cm. crassis, pedicellis 5–8.5 mm. longis; capsulis 9–12 mm. longis.

Tree 2–6 m. high, the larger trunks 1–1.5 dm. in diameter, with the nearly plane scarcely rugose leaves becoming 1 dm. long in maturity; mature pistillate aments very large, 2.5–3 cm. thick; pedicels 5–8.5 mm. long; capsules 9–12 mm. long.— QUEBEC, abundant on banks of the St. Lawrence from Rimouski Co. to Gaspé Co. Type material: limestone ledges, Bic., July 4–6, 1906 (*Fernald & Collins*, nos. 208, 495).

Along the gravelly half-inundated margin of the River Ste. Anne des Monts occurs an unusually attractive little shrub, its slender smooth branches rarely more than 2 or 3 feet high and its short oblong or suborbicular dentate leaves suggesting to the casual observer the foliage of the common *Amelanchier spicata* (Lam.) C. Koch. (*A. rotundifolia* Roem.) of the region, rather than that of any of our willows. Prolonged study fails to show any American willow to which it is nearly related, but in foliage as well as in its sessile aments the shrub very strongly suggests the little known Siberian *Salix pyrolaefolia* Ledeb. as shown in Ledebour's beautiful plate. From that unique species the shrub of the Ste. Anne River differs in several important characters enumerated below, and it seems sufficiently distinct to merit the name

SALIX **obtusata** n. sp. Frutex parvus, ramis gracilibus castaneis glaberrimis; foliis oblongis vel terminalibus suborbiculatis 2–5 cm. longis 1–3 cm. latis dentato-serratis apice rotundatis basi rotundatis vel subcordatis junioribus arachnoideis tenuissimis pellucidis purpurascentibus demum coriaceis glabris supra viridibus subtus pallidioribus, petiolis gracilibus 5–12 mm. longis; stipulis cordatis persistentibus majoribus 5 mm. longis obscure glanduloso-dentatis; amentis sessilibus, femineis 5–20 mm. longis; squamis oblongo-ovatis obtusis subfuscis laxe villosis; capsulis glabris conico-subulatis rufescentibus vel flavescentibus 2–3 mm. longis breviter pedicellatis, pedicello nectarium valde superante; stylo parvo, stigmatibus minimis bifidis.

Low slender shrub (0.5–1 m. high): branchlets slender, glossy brown, glabrous: leaves oblong to suborbicular, 2–5 cm. long, 1–3 cm. broad, closely dentate-serrate, rounded or subcordate at base, rounded at apex, glabrous, or the youngest arachnoid-tomentose, at first thin and purple-tinged; later coriaceous, bright green above, slightly glaucous beneath; petiole slender, 5–12 mm. long: stipules cordate, persistent, the largest about 5 mm. long, obscurely glandular-

dentate: aments sessile upon the old wood, the pistillate short-cylindric, 0.5–2 cm. long: scales oblong-obovate, obtuse, brownish, loosely villous: capsule glabrous, conic-subulate, reddish or yellowish, 2–3 mm. long: pedicel 0.5 mm. long, much exceeding the very short nectary: style very short, the stigmas bifid; staminate aments not seen.— QUEBEC, inundated gravelly bars and beaches, River Ste. Anne des Monts, fruit July 15, 1906, mature foliage August 16, 1906 (*Fernald & Collins*, nos. 203, 203a).

Closely allied to and strongly simulating the Siberian *S. pyrolaefolia* Ledeb. but differing in its more shallowly toothed leaves, shorter sessile aments and very short style. The type specimens were collected from characteristic low shrubs associated with a number of other willows — *S. cordata, S. pellita, S. glaucophylla,* &c.— at the frequently inundated margins of a group of alluvial islands near the head of the Grand Rapids of the River Ste. Anne des Monts.

Salix fuscescens Anders., hitherto known only from northern and western Alaska and the adjacent coast of Siberia, is abundant in bogs on the serpentine tableland of Mt. Albert. It is a very attractive creeping shrub, in foliage and other characters strongly suggesting *S. pedicellaris* Pursh of our northern temperate regions (*S. myrtilloides* of American authors, not L.). From the lowland species, *S. fuscescens* is quickly distinguished by its usually obovate leaves, the more pubescent scales of the aments, the very short thickish pedicels (barely exceeding the scales), the long subulate nectary which is usually half as long as the pedicel, and the definite though short style. As stated, this attractive species is abundant in the bogs of Mt. Albert, where it is associated with numerous other plants typical of western and northern Alaska and adjacent Siberia — *Eriophorum Chamissonis* C. A. Meyer, *Conioselinum Gmelini* (C. & S.) Coulter & Rose, *Festuca altaica* Trin., &c.,— and although many colonies have the capsules quite glabrous as in the type of the species, others occupying extensive areas of bog, have the capsules distinctly pilose. These shrubs with pilose capsules seem otherwise identical with typical *S. fucescens* and they may be designated

SALIX FUSCESCENS Anders., var. **hebecarpa** n. var. Frutex parvus, ramis subflagelliformibus; foliis amentisque eis formae typicae similibus; capsulis pilosis.

Capsules pilose; characters otherwise as in the typical form.— QUEBEC, alpine bog, tableland of Mt. Albert, Gaspé Co., July 21, 1906 (*Fernald & Collins*, no. 207).

While studying the specimens and descriptions of Labrador willows the writer has often wondered that *Salix adenophylla* should have been described as a unique species from Labrador and that we should now know the plant only from the sand dunes of the Great Lakes. A careful study of Hooker's original description of *S. adenophylla* and of Andersson's fuller descriptions of the type material shows that the shrub of the Great Lakes can have no close affinity with *S. adenophylla* and it is here proposed as

SALIX **syrticola** n. sp. Frutex altus vel mediocris laxe procumbens, ramis crassis cinereo-tomentosis vel puberulis; foliis ovatis vel late lanceolatis acuminatis cordatis vel subcordatis crebre glanduloso-serrulatis junioribus sericeo-lanatis demum firmis viridibus opacis lanatis vel glabratis 3–10 cm. longis 2–5 cm. latis, petiolis brevibus latis cinereo-pubescentibus; stipulis conspicuis foliaceis cordato-ovatis glanduloso-serrulatis petiolos valde superantibus; amentis pedunculatis foliis patulis 3–6 suffultis, masculis 2.5–4.5 cm. longis circa 1 cm. crassis, femineis 2–4.5 demum 5–10 cm. longis 1–1.5 cm. crassis; squamis oblongis fulvis valde tomentosis vel longe sericeis; capsulis conico-subulatis glabris rufescentibus 5–7 mm. longis basi rotundatis vel subcordatis pedicellatis, pedicello glabro 0.5–1 mm. longo nectarium prope triplo superante; stylo 0.5–1 mm. longo, stigmatibus vix bifidis.

Large straggling shrub: branchlets stout, cinereous-tomentose or -puberulent; leaves ovate to broadly lanceolate, acuminate, cordate or subcordate, closely glandular-serrulate, silky-lanate when young, often becoming glabrate, in maturity firm, dull green, 3–10 cm. long, 2–5 cm. broad; petioles short and broad, dilated at base, cinereous-pubescent: stipules conspicuous, foliaceous, cordate-ovate, glandular-serrulate, much exceeding the petioles: bud-scales cinereous-tomentose: aments appearing with the leaves, on leafy-bracted peduncles, the bracts 3–6, resembling the leaves; staminate aments 2.5–4.5 cm. long, about 1 cm. thick; pistillate 2–4.5, becoming in fruit 5–10 cm. long, 1–1.5 cm. thick: scales oblong, pale brown, very densely long-silky or tomentose: capsule conic-subulate, glabrous, rufescent, 5–7 mm. long, rounded or subcordate at base: pedicel glabrous, 0.5–1 mm. long, nearly twice as long as the nectary: style 0.5–1 mm. long; stigmas obscurely bifid: stamens 2, the filaments glabrous.— *S. adenophylla* Bebb, The Lens, ii. 249 (1873), and in Gray, Man. ed. 6, 485 (1890); Britton in Britton & Brown, Ill. Fl. i. 504, fig. 1203 (1896); not Hook. Fl. Bor. Am. ii. 146 (1839).— Sand dunes and beaches along the Great Lakes. A sheet in the Gray Herbarium from sandy shores of Lake Michigan, near Chicago, *H. H. Babcock*, 1880 (Bebb, Herbarium Salicum, no. 2) may serve as the type.

This handsome shrub is one of the best marked species in the group,

and apparently only through his extreme caution in characterizing new species was it allowed by Mr. Bebb to pass so long for the little known *Salix adenophylla* Hook. Hooker's species from Labrador is still known only from the original specimens and descriptions, but so many of the older and hitherto obscure northern species have recently come to light that we may confidently hope soon to understand more clearly *S. adenophylla*. At present our best information upon this species is that given in the original description by Hooker and later from the type material by Andersson. It is noteworthy that Hooker, following the system of Barratt, placed his Labradorean *S. adenophylla* immediately after *S. speciosa* and *S. Barrattiana* (two of our most remarkable willows, with the large aments chiefly sessile at the tips of the old branchlets) and not in the section with *S. cordata* to which *S. syrticola*, the shrub of the Great Lake region, is clearly related.

The original description of *S. adenophylla* gives account of little besides the leaves: "foliis ovatis basi cordatis acutis.... argute serratis serraturis elongatis glanduliferis.... stipulis ovato-cordatis grosse glanduloso-serratis"; [1] but that the elongate glanduliferous serratures were sufficient in Hooker's mind to distinguish the species is shown by his note: "I know no species like this, well marked as it is by the copious long narrow serratures to the leaves tipped with a gland, so that the leaf looks as if it were fringed with pedicellated glands." [1] This remarkable character of the foliage is sufficient, even if the habitat, Labrador, were not almost convincing, to show that Hooker's plant could not have been the same as the common sand dune shrub of the Great Lakes; and when we refer to Andersson's account [2] of the Hookerian type, we find added corroboration in the statements of other characters: "folia.... majora pollicem longa" (in *S. syrticola* the larger are a full decimeter — 4 inches — long, and the smallest examined are 3 cm. long); the fully mature fruiting ament "1½ poll. longa" (in *S. syrticola* 5–10 cm. — 2–4 inches); "squamis .... glabriusculis" (in *S. syrticola* very densely and persistently long-silky or tomentose); "pedicello cinereo" (in *S. syrticola* glabrous and straw-colored).

GRAY HERBARIUM.

[1] Hook. Fl. Bor.-Am. ii. 146 (1839).

[2] DC. Prodr. xvi. 254. (1864).

NEW STATIONS FOR TWO VERMONT PLANTS.— This season I found beside the road, near the long bridge across West River, about a mile above Townshend village, a plant which proved to be *Berteroa incana*, DC. It was growing in considerable abundance in a light sandy field.

Up to the time of the publication of the Brainerd, Jones, and Eggleston's Flora of Vermont this plant had been reported from but three stations in the state.

I have found *Sisymbrium altissimum*, L. in two places in Jamaica this season: one in our strawberry field and again in a neighbor's door-yard. Mr. Dobbin of Shushan, New York, while in town this year, found it beside the railroad above Jamaica depot. This also seems to be one of the infrequent but increasing Vermont plants.— LESTON A. WHEELER, Jamaica, Vermont.

NEW ENGLAND SPECIES OF PENIUM.

JOSEPH A. CUSHMAN.

SPECIES of the genus *Penium* cannot be called common in New England although specimens are usually met with in nearly all gatherings of Desmids of any richness. Many of the species are inconspicuous and a few of them minute. Twenty-eight species are known from the British Isles while but twelve are recorded here from New England. Two of these are recorded here for the first time. The forms which have not been previously recorded are preceded by an asterisk. All records for which specimens have been seen are followed by an exclamation point. A brief synonymy is given to clear up some of the names used in American works and to give references to published figures. A key is given to the species recorded here, based upon that of the Wests. Measurements and descriptions unless otherwise stated are based upon New England specimens.

PENIUM Bréb., 1844.

Cells straight, usually cylindrical or fusiform, with or without a slight median constriction; each semicell with a single axile chloro-

plast with radiating plates, entire at the outer edges, each chloroplast with one or more pyrenoids, when several, in an axile series; cell wall usually with pores.

Key to the New England Species of Penium.

I Cells unconstricted, smooth.
  1. Cells large, breadth 20–50 μ . . . . *P. Libellula.*
  2. Cells small, breadth 10–15 μ . . . . *P. Navicula.*

II Cells usually constricted in the middle.
  1. Cell wall granulate.
    A. Cell wall granulate over its entire surface.
      a. Cells large, usually more than 100 μ long *P. margaritaceum.*
      b. Cells minute, usually less than 30 μ long . *P. cuticulare.*
    B. Granules restricted to the ends of the cell . . *P. Clevei.*
  2. Cell wall striated.
    A. Cells large, striations distinct, spirally arranged *P. spirostriolatum.*
    B. Cells small, striations longitudinal and indistinct.
      a. Breadth usually more than 20 μ . . *P. polymorphum.*
      b. Breadth usually less than 20 μ . . *P. phymatosporum.*
  3. Cell wall smooth or punctate.
    A. Cells 2–4 times as long as broad.
      a. Cell wall punctate . . . . . *P. curtum.*
      b. Cell wall smooth . . . . . *P. cruciferum.*
    B. Cell elongate, many times as long as broad . *P. minutum.*
  4. Cell with annulations . . . . . *P. annulare.*

Penium Libellula (Focke) Nordst.

Closterium Libellula Focke, Physiologische Studien, 1847, p. 58, pl. 3, fig. 29.

Penium Libellula Nordst., Videnskab. Meddel. f. d. naturh. Foren. i. Kjöbenhavn, 1888. p. 184; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 73, pl. 7, figs. 6, 7.

Penium closterioides Ralfs, Brit. Desm., 1848, p. 152, pl. 34, fig. 4; Wood, Smithson. Contrib. to Knowl. No. 241, 1874, p. 109; Wolle, Desm. U. S., 1884, p. 35, pl. 5, fig. 18.

Cells large, 4½–6½ times as long as wide, fusiform, no constriction, ends subtruncate, polar vacuoles with several moving granules.

Length 186–233 μ; maximum breadth 38–50 μ.

N. H.: Intervale, scarce! Pudding Pond, North Conway, common!

North Woodstock, common! Mass.: Medford! Bridgewater! East Bridgewater! Lake Watuppa, Fall River!

Penium Libellula, var. interruptum (West) W. & G. S. West.

Penium closterioides, forma *interrupta* West, Journ. Roy. Micr. Soc., 1892, p. 721.

Penium Libellula, var. *interruptum* W. &. G. S. West, Journ. Roy. Micr. Soc., 1897, p. 479; Brit. Desm., vol. 1, 1904, p. 74, pl. 7, figs. 9, 10.

Smaller than the typical form, the chloroplasts divided three times transversely, therefore in each cell four chloroplasts each containing a pyrenoid.

Length 120–170 μ; breadth 22–37 μ.

N. H.: Pudding Pond, North Conway! Mass.: Pondville! Plainville!

Penium Libellula, var. intermedium Roy & Biss.

Penium Libellula, var. *intermedium* Roy & Biss., Ann. Scot. Nat. Hist., No. 12, Oct. 1894, p. 252; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 74, pl. 7, fig. 11.

Differs from the typical form in size, being about one half the size, otherwise typical.

Length 124 μ; breadth 22 μ.

Mass.: Pondville!

Penium Navicula Bréb.

Penium Navicula Bréb., Mem. d. l. soc. imp. sc. nat. Cherbourg, vol. 4, 1856, p. 146, pl. 2, fig. 37; Wolle, Desm. U. S., 1884, p. 36, pl. 5, fig. 16; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 75, pl. 7, fig. 12–15, 19.

Cells small, 3½–4½ times as long as wide, fusiform, no constriction, ends broadly rounded, vacuoles with two or three moving granules.

Length 55–60 μ; breadth 14 μ.

Me.: Orono (*W. West*); Mass.: Plainville! Lake Watuppa, Fall River!

Penium margaritaceum (Ehrenb.) Bréb.

Closterium margaritaceum Ehrenb., Die Infusionthierchen als volkommene Organismen, 1838, p. 95, pl. 6, fig. XIII.

Penium margaritaceum Bréb., in Ralfs. Brit. Desm., 1848, p. 149, pl. 25, fig. 1, *a–c*; Wood, Smithson. Contrib. to Knowl. No. 241, 1874, p. 107; Wolle, Desm. U. S., 1884, p. 34, pl. 5, figs. 5, 6, 11; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 83, pl. 8, figs. 32–35.

Cells 7–11 times as long as wide, cylindrical, median constriction present, ends broadly or truncately rounded, cell wall with granules arranged in longitudinal rows, reddish or yellowish brown in color.

Length 120–240 μ; breadth 17–22 μ; apices 12–15 μ.

Me.: Orono (*Harvey*), Kittery, not common! N. H.: Plymouth (*Wests*); Pudding Pond, North Conway! Intervale! Vt.: (*Wolle*); Mass.: Amherst (W. West); Lake Quinsigamond, Worcester (*Stone*); Bridgewater! Lake Watuppa, Fall River! R. I.: Wainskut Pond, North Providence (Bailey); Conn.: (*Wolle*).

This is one of our most striking species and easily noted, yet cannot be called common.

* PENIUM CUTICULARE W. & G. S. West.

Penium cuticulare W. & G. S. West, Journ. Roy. Micr. Soc., 1896, p. 153, pl. 4, figs. 43, 44; Brit. Desm., vol. 1, 1904, p. 85, pl. 6, figs. 4, 5.

Cells minute, 2½ times as long as wide, cylindrical, no constriction, ends broadly and truncately rounded, cell-wall reddish brown, minutely but irregularly papillose.

Length 22 μ; breadth 9.3 μ.

Mass.: Lake Watuppa, Fall River!

PENIUM CLEVEI Lund., var. CRASSUM W. & G. S. West.

Penium Clevei Lund. Desm. Suec., 1871, p. 86, pl. 5, fig. 11; var. *crassum* W. & G. S. West, Journ. Roy. Micr. Soc., 1894, p. 4, pl. 1, fig. 5; Brit. Desm., vol. 1, 1904, p. 88, pl. 8, fig. 38; Cushman, Bull. Torrey Club, vol. 32, 1905, p. 225, pl. 7, fig. 8.

Cells about twice as long as wide, lateral margins decidedly convex, slightly constricted in the middle, ends of the cell finely granulate, chloroplast with a single large pyrenoid. Zygospore spherical, with numerous broad, squarely truncated processes.

Length 80–96 μ; breadth 40–44 μ; isthmus 38.5–40 μ; breadth of zygospore with processes 68–78 μ: without processes 54–57 μ.

Mass.: Pondville!

This is the only record for the zygospore of this species.

Penium spirostriolatum Barker.

Penium margaritaceum, var. *punctatum* Ralfs, Brit. Desm., 1848, p. 149, pl. 25, figs. 1, *d–h*.

Penium spirostriolatum Barker, in Quart. Journ. Micr. Sci., vol. 9, 1869, p. 194; Wolle, Freshw. Alg. U. S., 1887, p. 22, pl. 61, fig. 19; G. S. West, Journ. Linn. Soc. Bot., vol. 34, 1899, p. 377–380; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 88, pl. 9, figs. 1–8.

Cells large, about 9 times as long as wide, cylindrical, with a slight median constriction, slightly attenuated toward the rounded apices, transverse sutures apparent, cell wall yellowish brown, marked with longitudinal striae, variably twisted especially near the ends of the cell.

Length 202–233 μ; breadth 19–25 μ; apex 15–16 μ.

Me.: Orono (*W. West*); Mass.: Winchester! Lake Watuppa, Fall River!

* Penium spirostriolatum, var. **apiculatum** var. nov.

Cells about four times as long as wide, central portion cylindrical, at each end very abruptly narrowed for about one-sixth of the length.

Length 84 μ; breadth 21 μ; apices 11.5 μ.

Mass.: Plymouth!

Penium polymorphum Perty.

Closterium polymorphum Perty, in Bern. Mitth. 1849, p. 28.

Penium polymorphum Perty, Kleinist Lebensf., 1852, p. 207; Wolle, Desm. U. S., 1884, p. 36, pl. 5, fig. 12; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 90, pl. 9, figs. 9–11.

Cells small, about 2½ times as long as wide, cylindrical with a slight median constriction, very slightly attenuated toward the broadly rounded apices, cell-wall with inconspicuous, longitudinal striations.

Length 50 μ; breadth 20 μ.

Vt.: Charlotte (*Wolle*); N. H.: Pudding Pond, North Conway, occasional! Mass.: Amherst (*W. West*).

Penium phymatosporum Nordst.

Penium phymatosporum Nordst., Desm. Ital., 1876, p. 26, pl. 12, fig. 1; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 91, pl. 6, figs. 9–11.

Cells small, about 2¼ times as long as wide, with a very slight constriction, very slightly attenuated toward the truncately rounded apices, cell wall with delicate longitudinal striations.

Length 35–40 μ; breadth 15.5–16.5 μ; isthmus 13.5 μ.

Mass.: Tom Never's Pond and pond near Old North Cemetery, Nantucket!

PENIUM CURTUM Bréb.

Closterium curtum Bréb., in Desm., 1838, fasc. 19, No. 901.

Cosmarium curtum Ralfs. Brit. Desm., 1848, p. 109, pl. 32, fig. 9.

Penium curtum Bréb., in Kütz., Spec Alg., 1849, p. 167; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 97, pl. 10, figs. 21, 22.

Calocylindrus curtus Wolle, Desm. U. S., 1884, p. 54, pl. 12, figs. 15, 16.

"Cells small, sometimes minute, a little more than twice longer than their diameter, with a distinct median constriction; semi-cells attenuated, sides convex, apex rounded and sometimes slightly thickened; cell wall punctate; chloroplasts with about eight longitudinal ridges."

Length 22–60 μ; breadth 10.5–32.5 μ; breadth of isthmus 9.5–30 μ.

Mass.: Amherst (*W. West*).

Personally I have not met with this species in New England. It has been found in Massachusetts by West and in several states outside of New England by Wolle. The description and measurements are from the Wests' British Desmids.

* PENIUM CRUCIFERUM (DeBary) Wittr.

Cosmarium? cruciferum DeBary, Conj., 1858, p. 72, pl. 7, G, figs. 3–6.

Penium cruciferum Wittr., in Wittr. & Nordst., Alg. Exsicc. No. 482, 1882; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 100, pl. 10, figs. 18, 19.

Cells small, about 1½ times as long as wide, with a slight median constriction, apices broadly rounded, cell wall smooth and colorless.

Length 15.5 μ; breadth 10 μ; isthmus 9.3 μ.

Mass.: Lake Watuppa, Fall River, common!

PENIUM MINUTUM (Ralfs) Cleve.

Docidium minutum Ralfs., Brit. Desm., 1848, p. 158, pl. 26, fig. 5; Wolle, Desm. U. S., 1884, p. 52, pl. 10, fig. 9, pl. 50, figs. 29–31.

Penium minutum Cleve, Ofvers. af K. Vet.-Akad. Förh., 1864, p. 493; Wolle, Desm. U. S., 1884, p. 35, pl. 5, figs. 19, 20; W. & G. S. West, Brit. Desm., vol. 1, 1904, p. 101, pl. 10, figs. 1, 2.

Calocylindrus minutus Wolle, Desm. U. S., 1884, p. 54, pl. 5, figs. 19, 20, pl. 12, fig. 12.

Cells elongate cylindrical, 8–12 times as long as wide, with a clearly defined median constriction, gradually attenuated to the truncate apices, cell wall colorless, smooth or punctate.

Length 114 μ; breadth 13 μ.

Mass.: Lake Quinsigamond, Worcester (*Stone*); Tewksbury (*Lagerheim*); R. I.: (*Bailey*).

I have not as yet found the typical form in New England. The measurements are those given by Lagerheim of a Massachusetts specimen.

Penium minutum, var. elongatum W. & G. S. West.

Penium minutum, var. *elongatum* W. & G. S. West, Trans. Linn. Soc. Ser. 2, Bot. vol. 6, no. 3, 1902, p. 136; Brit. Desm., vol. 1, 1904, p. 104, pl. 10, fig. 8.

Cells much longer than in the typical form, 40 tiines as long as wide.

Length 372 μ; breadth 9 μ.

N. H.: Pudding Pond, North Conway!

Penium annulare West.

Penium annulare West, Journ. Bot., vol. 29, 1891, p. 354, pl. 315, figs. 5, 6; Johnson, Bull. Torrey Club, vol. 21, 1895, p. 290, pl. 239, fig. 1.

"Penium of medium size, about 7 times as long as wide, subcylindrical, with median constriction (or subconstricted), gradually attenuated from the middle to the subtruncate apices, with distinct annulations (about 14–22): in end view circular; cell wall colorless, densely and irregularly punctate."

Length 130–177 μ; breadth 20–23 μ.

Me.: Scarbro', abundant (*W. West*). This is the type locality.

Penium annulare, var. obesum West.

Penium annulare, var. *obesum* West. Journ. Bot., vol. 29, 1891, p. 354, pl. 315, fig. 7.

"Variety about 3 times as long as wide, with fewer annulations (about 9)."

Length 106 μ; breadth 31–34 μ.

Me.: Scarbro', rare (*W. West*). Type locality.

I have not seen this species although the type locality is in Maine. There are three other stations for this species in the United States but it has not been found in New England since its first discovery. The descriptions are rough translations of the originals. The measurements are those given by West.

BOSTON SOCIETY OF NATURAL HISTORY.

ERRATA.

Page 24, line 15; for *atropurpuresa*, *Juncu* read *atropurpurea*, *Juncus*.
" 54, " 5; for Razoumowsk a *read* Razoumowskia.
" 55, " 2; " Med k *read* Medik.
" 64, " 1; " use *read* rise.
" 116, " 8; " *microphyllum* read *semiorbiculatum*.
" 122, " 7; " *Amonum* read *Amomum*.
" 124, " 27; " *Cyprepedium* read *Cypripedium*.
" 126, " 1; " *amphirhyncus* read *amphirhynchus*.
" 129, " 9; " *strigilis* read *strigile*.
" 130, " 1; " *Ditylum* read *Ditylium*.
" 132, " 1; after *Navicula* insert *nobilis*.
" 148, " 12; *for* Lauholzkunde *read* Laubholzkunde.
" 164, " 25; *for* Wormskjoldii *read* Wormskioldii.
" 199, " 14; for *Herbipolenis* read *Herbipolensis*.
" 199, " 37; " *Aromachys* read *Aromochelys*.

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Very Truly Yours
George E. Davenport

Rhodora

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GEORGE EDWARD DAVENPORT.

F. S. Collins.

(With portrait.)

George Edward Davenport was born in Boston, August 3d, 1833, the son of William E. and Deborah (Skidmore) Davenport, both of old Boston families. He completed the regular public school course, graduating from the High School. At twenty years of age he married Miss Mary Francis and removed to South Boston, remaining there until 1875, after which date his home was at Medford. He died November 27, 1907, leaving a wife, eight children, ten grandchildren and one great grandchild.

Even in his school days he was much interested in nature studies, soon concentrating the interest on botany, later making ferns a specialty, which they remained all of his life. The study, however, had to be pursued in what time was left from an active business, which he kept up till two years before his death. In all the study of the ferns for the past forty years he had a noteworthy part; though no work of great volume remains from his pen, his influence is to be seen in much of what has been published by others, and his shorter articles are to be found in many botanical publications, notably the Bulletin of the Torrey Botanical Club, the Fern Bulletin and Rhodora. The bibliography of these articles at the end of this note, compiled by Miss Mary A. Day of the Gray Herbarium, is probably fairly complete, but does not attempt to include the many articles he wrote referring more especially to forestry or horticulture. He had long been at work on a manual of the North American ferns, but when his release from business cares gave him the time he so much needed for the task, sight and strength were no longer equal to it, much to his sorrow. The last

two years his time was largely spent in his garden; here in small compass was a remarkable variety of conditions, rich ground, swamp, rocky hillside; here he had growing nearly every fern found in New England, and here too he watched with much interest a little group of flowering plants, selected as best showing the phenomena of heredity and mutation that now attract so much interest. The enthusiasm with which he showed me these treasures one Sunday morning early in last October, will always be a most pleasant recollection.

It would seem that an active business life and the thorough study of a specialty would be all that one could achieve; but he had other interests as well. He was an active worker in the anti-slavery movement, one of the first to be interested in labor reform questions, a leading spirit in the work of securing for the public the Middlesex Fells, and for eighteen years he was a member of the school board of Medford. He was an original member of the New England Botanical Club, a life member of the Massachusetts Horticultural Society and a fellow of the American Academy of Arts and Sciences.

I first became acquainted with him at the time of the formation of the Middlesex Scientific Field Club, of which he was one of the chief promoters; in the many excursions we made in the Fells region and elsewhere in the county he was a leader, and his knowledge of the region was of much value for the Flora of the county, published by the Middlesex Institute; he was always ready to give his time and advice to those of us who were then beginners, and whose ignorance must have seemed to him monumental. He was a man of strong and enduring attachments; sensitive as a woman, but with a man's courage in defense of his convictions. Whatever he believed in he championed with an almost passionate devotion; whether it were the giving of freedom to the slave, the rescuing of the Fells from destruction, or the true theory of the terminal bud of Botrychium, he would fight for it as long as his strength endured. That others could not take the same stand, indeed might hold other views, seemed often to surprise and distress him, but never impaired his kindness of heart to the delinquents. Though a careful student of details of structure and development, he never lost sight of the beauty of the living plant, and he was a lover of nature all his life. No more fitting end to his life can be imagined than that which came to him, in open air, among the familiar objects of his loved Middlesex Fells, now, so much by his own exertions, safe for all time.

The Botanical Writings of the late George Edward Davenport.

[The following list of Mr. Davenport's writings has been kindly prepared at our request by Miss Mary A. Day to accompany the above sketch. It is due to Miss Day to state that the compilation has been made with unavoidable haste and during pressure of other work. Although a wide range of periodical literature has been examined and all Mr. Davenport's botanical papers and notes have been included so far as they have been found, it is quite possible that some titles have been overlooked, especially as Mr. Davenport's botanical activity extended through a long period of years and his publications have been widely scattered. — Ed.]

1. Catalogue of North American ferns in the herbarium presented to the Massachusetts Horticultural Society by George E. Davenport, June 5, 1875.

1a. Flora of Medford [with a full account of the ferns of Massachusetts. Being a series of papers published in the Medford Chronicle]. 1875–1876.

2. Asplenium Filix-foemina, Bernh. var. laciniatum, Moore. Bull. Torr. Bot. Club, vi. 88. Apr. 1876.

3. Aspidium Thelypteris, Swz. Bull. Torr. Bot. Club, vi. 113. Oct. 1876.

4. Forking ferns. Bot. Gaz. ii. 80–81. Feb. 1877.

5. Aspidium spinulosum Swz. Bot. Gaz. ii. 81. Feb. 1877.

6. Variations in Lomaria and Polypodium. Bull. Torr. Bot. Club, vi. 136. Feb. 1877.

7. Asplenium Filix-foemina, var. laciniatum Moore. Bull. Torr. Bot. Club, vi. 168. Aug. 1877.

8. Vitality in ferns. Bot. Gaz. ii. 134. Sept. 1877.

9. Botrychium Lunaria in New York state. Bull. Torr. Bot. Club, vi. 176. Sept. 1877.

10. Variations of color in flowers. Bot. Gaz. ii. 141–142. Oct. 1877.

11. Notes on Botrychium simplex, Hitchcock. Nov. 1877.

12. A new Cheilanthes. Bull. Torr. Bot. Club, vi. 190–191. Dec. 1877.

13. Vernation in Botrychia, with special reference to its importance as a means for distinguishing the different species. Bull. Torr. Bot. Club, vi. 193–199, plate. Jan. 1878.

14. ASPLENIUM EBENOIDES, R. R. SCOTT. Bull. Torr. Bot. Club, vi. 200. Jan. 1878.
15. CAMPTOSORUS IN EASTERN MASSACHUSETTS. Bull. Torr. Bot. Club, vi. 206. Feb. 1878.
16. BOTRYCHIUM SIMPLEX, HITCHC., IN MASS. Bull. Torr. Bot. Club, vi. 234. June, 1878.
17. POLYGAMOUS FLOWERS IN POPULUS. Bot. Gaz. iii. 51. June, 1878.
18. FERNS OF KENTUCKY. Bot. Gaz. iii. 54–55. June, 1878.
19. ASPIDIUM SPINULOSUM (SWARTZ) AND ITS VARIETIES. Am. Nat. xii. 707–717. Nov. 1878.
20. CATALOGUE OF THE "DAVENPORT HERBARIUM" OF NORTH AMERICAN FERNS NORTH OF MEXICO. Salem, 1879.
21. ASPIDIUM BOOTTII TUCKERMAN. Am. Nat. xiii. 186-188. Mar. 1879.
22. FERN ETCHINGS. BY JOHN WILLIAMSON, AUTHOR OF THE FERNS OF KENTUCKY, LOUISVILLE, KY. JOHN P. MORTON & CO., PUBLISHERS. Bull. Torr. Bot. Club, vi. 351. Oct. 1879.
23. TRAPA NATANS. Bull. Torr. Bot. Club, vi. 352. Oct. 1879.
24. PTERIS AQUILINA. Bot. Gaz. v. 30–31. Mar. 1880.
25. A NEW FERN. Bull. Torr. Bot. Club, vii. 50–51. May, 1880.
26. FERN NOTES. Bull. Torr. Bot. Club, vii. 85–86. Aug. 1880.
27. "SYSTEMATIC FERN-LIST." Bot. Gaz. v. 131–132. Oct. 1880.
28. VERNATION OF BOTRYCHIUM BOREALE, MILDE. Bull. Torr. Bot. Club, vii. 115–116. Nov. 1880.
29. THE FLORA OF ESSEX COUNTY, MASSACHUSETTS, JOHN ROBINSON, ESSEX INSTITUTE, SALEM, 1880. Bot. Gaz. vi. 187–188. Mar. 1881.
30. THE HERBARIA AND BOTANICAL LIBRARIES OF THE UNITED STATES. IV. THE MASSACHUSETTS HORTICULTURAL SOCIETY. Bull. Torr. Bot. Club, viii. 30–32. Mar. 1881.
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89. A PLUMOSE VARIETY OF EBONY SPLEENWORT. Rhodora, iii. 1–2, pl. 22. Jan. 1901.
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BOTRYCHIUM RAMOSUM ASCHERSON. Fern Bull. xiv. 11–19, pl. 1, 2. Mar. 1906.

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Articles relating to Mr. Davenport's herbarium and work.

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CATALOGUE OF NORTH AMERICAN FERNS. [Notice of] Bull. Torr. Bot. Club, vi. 273. 1878.

[EDITORIAL NOTE ON WORK OF MR. DAVENPORT.] Fern Bull. viii. 70. 1900.

[ACCOUNT OF HERBARIUM.] Rhodora, iii. 220. 1901.

[EDITORIAL NOTE ON LIFE AND WORK OF MR. DAVENPORT, WITH PORTRAIT.] Fern Bull. ix. 44. 1901.

NOTES ON FUNGI,— I.

W. G. FARLOW.

TREMELLA RETICULATA. While botanizing at Lake Dunmore, Vermont, in September, 1896, I found a quantity of a tremellinaceous fungus growing over the ground and fallen branches in a coniferous wood. The season was very wet and the fungus, owing to the rain, was in places reduced to shapeless masses, but there remained a number of specimens which retained their normal habit. From a solid gelatinous base there rose to the height of 7.5 cm. (3 inches) or more masses of a white jelly, which resembled in outline certain large and coarse species of *Cladonia*, as *C. Boryi* Tuckm. Subcylindrical branches arose from a common base, more or less anastomosing below, reticulated and becoming free and irregularly forking upwards, the branches gradually tapering to the tips, which were fimbriate. The color when fresh was white except at the tips, which were somewhat yellowish or brownish. In drying, the whole fungus shrivelled very much and became a yellow brown. Microscopic examination showed

a typical tremelline structure, with hyphae embedded in jelly and basidia divided vertically into four parts. The spores, which were not very abundant in specimens examined, were broadly allantoid or broadly elliptic with one side flattened and the lower part apiculate on the inner side. They measured 8 μ–10 μ × 5 μ–6 μ. The germination could not be studied.

When fresh and in good condition the fungus is very striking and does not resemble any other of our *Tremellinaceae* known to me. An examination of the literature led me at first to think that the species was *Tremella fuciformis* Berk. from the Amazon, described in Hooker's Jour. Bot. 1856, p. 277 and later recorded from Cuba in Jour. Linn. Soc. **10**, 340, 1869. A later examination, however, convinced me that the fungus is the same as that described by Berkeley under the name of *Corticium tremellinum* B. & Rav., var. *reticulatum* Berk. in Grevillea **1**, 180, June, 1873. In explanation of my reasons for forming this opinion it is necessary to refer to certain specimens which I have examined.

In Herb. Curtis are four specimens marked *Corticium tremellinum* including the variety *reticulatum*. The first, from the collection cited in Grevillea, is marked "In caudice Filicis? Cotoosa Springs, Ga., 1853. Ravenel (1754)"; the second is marked "Ad basin culm. et gramin., Sept. 1855. Ala. Super. Peters (897)"; the third is marked "(6393) Wisconsin, coll. Lapham. Sprague (996)." The three specimens above named are all called *C. tremellinum*, the fourth is marked "*Corticium reticulatum*. Damp naked earth under shrubbery in a garden, Penna., 1851. Michener (1212) (3942)," the collection cited in Grevillea under the variety *reticulatum*. There are besides two duplicate specimens from Michener inserted in Herb. Curtis and all three specimens are identical in structure.

The specimen of Lapham from Wisconsin may be excluded from consideration, since it shows no characteristic structure and is a mixture of different things entangled in hyphae which cannot be referred to any particular genus. In the next place, an examination of the other three specimens shows that none of them belongs to the genus *Corticium* but that all are *Tremellinaceae*, since they have the characteristic 4-parted basidia. The specimen from Cotoosa Springs (*Ravenel*) and that from Alabama (*Peters*) appear to be the same species, but the so-called variety, Pennsylvania (*Michener*), is quite different. The former are more or less bullate masses, wrinkled and

cerebriform on the surface as is the case in several species of *Tremellinaceae*. The specimens from Michener are undoubtedly the same as the fungus collected at Lake Dunmore.

Of specimens of *T. fuciformis* Berk. there is in Herb. Curtis one from Cuba marked "Ad lign. corrump. Sept. C. Wright (233). This specimen has a certain general resemblance to *C. reticulatum*, but a microscopic examination shows that it is a much thinner and more delicate species; the hyphae are not closely compacted and the hymenium is looser and thinner. Furthermore, although the specimen is by no means all that could be desired, one can see that the tips are not cylindrical-tapering and fimbriate as in *C. reticulatum*, but complanate and, as was remarked by Berkeley in the original description, recall in their habit species of *Chondrus*. The expression, flabelliformi-dilatata, used by Berkeley does not apply certainly to our plant.

There have been few references in mycological literature to *Corticium tremellinum* since its original publication. In Grevillea **20**, 13, Sept. 1891, the var. *reticulatum* is called by Cooke *Corticium reticulatum*; the original name, *C. tremellinum* and its variety, are retained in Saccardo's Sylloge **6**, 632, 1888, and by Massee in Jour. Linn. Soc. **27**, 146, 1890, and O. Kuntze in Rev. Gen. Plant. **2**, 873, 1891 changed the name to *Terena tremellina*. References to *Tremella fuciformis* are more numerous. There may be mentioned here Patouillard, Essai Taxonomique 21, Duss, Champignons Guadeloupe et Martinique 9, and Hennings, Verh. Bot. Ver. Brandenburg, **40**, 113, 1898 where the species is reported as occurring in hot houses at the Botanical Garden of Berlin. A. Moeller in Protobasidiomyceten 115 et seq., 1895, gives a detailed account of *T. fuciformis* found by him in Brazil. Although he had been unable to examine a type specimen of the species, there can be no reasonable doubt that the fungus studied by him was the true *T. fuciformis*. He mentions the great resemblance in habit to *Chondrus* and his photograph, Pl. I, f. 5, shows that it is not our plant. Apparently also the spores are ovoid and not of the same shape as in *C. reticulatum*.

In North America *T. fuciformis* has been reported by Atkinson, Mushrooms, 206, f. 207, 1901, by R. Campbell, Canadian Rec. Sci. **9**, 98, 1903, and by Brown and Fernekes, Bull. Wis. Nat. Hist. Soc. **2**, 55, 1902. Whether the species referred to by the writers above named is the *T. fuciformis* of South America and the West Indies or the *C. reticulatum* of Pennsylvania and Vermont I am not at present

able to say. From the plate of Atkinson, together with his description including the account of the spores, I am inclined to believe that his plant is the same as that found in Vermont. So much can be said with certainty that specimens and photograph received last September from Ohio from Mr. C. G. Lloyd show that the species extends from Vermont and Pennsylvania to Ohio.

In short, *Corticium tremellinum* B. & Rav. is not a *Corticium* but a tremelline. *C. tremellinum* B. & Rav., var. *reticulatum* is a distinct species, which should bear the name **Tremella reticulata** (Berk.) Farlow, and to it should be referred the species above mentioned. Although for reasons given I do not now think that *T. reticulata* and *T. fuciformis* are identical, it remains for those who have an opportunity of seeing both the South American and our Northern fungus in fresh condition to furnish information to settle their identity beyond all doubt. If they are identical, then the name *T. fuciformis* has priority.

SYNCHYTRIUM PLURIANNULATUM (B. & C.) Farlow. In the Botanical Gazette, 10, 243, March, 1885, it was shown that *Uromyces pluriannulatus* B. & C., Grevillea, 3, 57, 1874, does not belong to the *Ur dinaceae* but to the *Chytridiaceae*, and it was referred by me to the genus *Synchytrium* with the statement that "the peculiarity of the ripe resting spores shows that the development must be studied before the exact position of the fungus can be decided." The hosts given were *Sanicula marilandica* and *S. Menziesii*, with a range from Illinois and Alabama to California. At that time I had been able to examine only dried specimens. Since then I have found the parasite on *S. marilandica* at Holderness, N. H., but in very small quantity, two leaves only being infected. I did not, when collecting it, recognize that the fungus was the same as that which I had studied from dried material for, when fresh, the appearance is more that of a gall of animal origin than of a *Synchytrium*. An examination of fresh material enabled me to see a character not noticed in the dried. The resting spores, or more properly sporangia, were not free in the enlarged epidermal cells in which they were parasitic but were attached at the centre of the flattened side to a hypha similar to that of *Urophlyctis Kriegeriana*, figured by Magnus in Annals of Botany, 11, Pl. 7, 1897. It was not possible for me to study the development of the fungus owing to the very scanty material and absence of proper equipment at the time it was collected, but it is evident that it must be

removed from *Synchytrium* and be placed in *Urophlyctis*. The name to be adopted is **Urophlyctis pluriannulatus** (B. & C.) Farlow. Its relation to *U. Kriegeriana* is very close and it may even be a question whether the species of Magnus, described in 1888, Sitzber. Ges. Naturf. Freunde, Berlin, p. 100, is not the same as the American species. The former grows in the epidermal cells of *Carum Carui* and the description of the galls formed as pearl-shaped with a depressed umbo at the apex applies well to those of *U. pluriannulatus* when seen in fresh condition and in general the microscopic characters of the galls and the sporangia are much the same in both species. The development of the American species, however, needs to be studied by some one living in the region where the fungus is less rare than in New England.

Although rare in the Northeastern States it is common apparently in the Central States and on the Pacific Coast. In Herb. Farlow it is represented by specimens not previously enumerated in the Botanical Gazette, l. c., as follows: Michigan (*H. L. Merrow*); Wisconsin (*J. J. Davis*); Illinois (*C. A. Hart*); Iowa (*B. D. Halsted*); Kansas (*Kellerman & Carlton*). In these states the hosts were *S. marilandica*, *S. gregaria*, and in one case, as it is said, *S. canadensis*. On the West Coast it has a range from San Diego Co. on *S. bipinnatifida* (*C. R. Orcutt*), La Honda (*T. S. Brandegee*), Santa Barbara on *S. arctopoides* (*Mrs. Brigham*), Tamalpais (*H. W. Harkness*), and Mendocino Co. (*W. C. Blasdale*) in California to Eugene, Oregon (*A. R. Sweetser*) and Mt. Tacoma on *Ligusticum apiifolium* (*E. W. D. Holway*), the common host plant in the Pacific States being *S. Menziesii*. It was distributed by Seymour & Earle in Economic Fungi Suppl. A, 10, and by Ellis & Everhart in North American Fungi, no. 1806, Fungi Columbiana, no. 652, and Winter, Fungi Europaei, no. 3474. The name *Caeomurus pluriannulatus* was given to the species by Otto Kuntze in Rev. Gen. Plant. 3^2, 450, 1898, in ignorance of the fact that it is not a *Uromyces*.

PUCCINIASTRUM ARCTICUM (Lagh.) Tranzsch. A few years ago while examining some leaves of *Rubus occidentalis* collected near Cambridge, which were infested with *Chrysomyxa albida* J. Kühn, a species placed in *Phragmidium* by recent writers, I found a very small but striking uredo, which did not apparently have any connection with the *Chrysomyxa* since it had a pseudoperidium such as is found

in certain melampsoraceous genera. A further examination showed very small teleutosporic sori, difficult to see, as they are concealed by the hairs on the *Rubus* leaves. I then searched among the unnamed uredoes on *Rubi*, which had gradually accumulated in the herbarium and found that the uredo in question was well represented in several collections, especially on *Rubus neglectus* Peck[1] and also less frequently on *R. strigosus*. It was abundant on specimens collected near the Bussey Institution in Oct. 1875, and also on specimens from Newton, Mass., in Sept. 1877, in company with a *Phragmidium*. In the Newton specimens both uredo and teleutospores were abundant. I have also specimens from Arlington, Mass. (*B. M. Davis*), from Ellis River, N. H. (*L. M. Underwood*), and from Madison, Wis. (*W. Trelease*), not to mention some recent collections. The uredo, which is scattered over the under side of the leaves, is at once distinguished by its peculiar peridium, which is conical, truncate, and contracted at the very narrow mouth, which is surrounded by a crown of from three to six cells, whose upper surface is aculeate, while below they are constricted, the wall of the lower part being much thickened. Around the base of the peridia, which are usually from 80 μ–90 μ in height and from 70 μ–75 μ in diameter at the base, there is a collar formed by the ruptured epidermis. The other cells of the peridium are irregularly rhomboidal, nearly transparent so that the spores beneath can be seen, and nearly smooth. Those above are longer than those below and in well developed specimens they have a more or less linear arrangement. The spores when young are generally obovoid but fully developed and especially the free spores have a very constant ellipsoidal shape, the average being 16–18 μ by 11–12 μ, some being as long as 22 μ. The surface is somewhat rough but not spiny.

This uredo is the same as the one described by Dietel in Hedwigia **44**, 330, Aug. 1905, of which he gave a characteristic figure. He considered it to be connected with *Phragmidium gracile*. The host is not mentioned but it is probable that Dietel's material came from the United States. While it is true that the uredo sometimes occurs in company with *Phragmidia* its real connection is without doubt with the teleutospores which I have referred to, for both belong to the melampsoric group and furthermore they are found together in cases where no *Phragmidia* are present. The only question seems to me to

[1] I am indebted to Prof. M. L. Fernald for the determination of the species of *Rubus* cited in this paper.

be whether the fungus on *Rubi* in the Northeastern United States is *Pucciniastrum articum* (Lagh.) Tranzschel, of which the uredo was first described on *Rubus arcticus* from Lapland by Lagerheim in Hedwigia **28**, 109, 1889, and the teleutospores by Tranzschel in Script. Bot. Hort. Univ. Imp. Petrop. **4**, 300, 302, 1895, from Finland and the Ural and on *R. saxatilis* near St. Petersburg. If not, it is certainly a closely related species. *P. arcticum* is given by Arthur in N. Am. Flora **7**, part 2, 107 as occurring on *R. stellatus* from Alaska in its uredo-form.

The only American specimen I have seen, which seems to belong to the typical *P. arcticum* is one collected at Grand Manan, N. B., on *R. triflorus* by Prof. K. Miyabe. Of European specimens I have examined the no. 857 of Vestergren, Microm. Rar. Select. in which the teleutospores are not present. There is nothing in the teleutospores of the New England fungus which would enable one to distinguish them from those described by Tranzschel. His description is as follows: "soris teleutosporarum hypophyllis, fuscis, parvis, planis. Teleutosporis globosis vel mutua pressione rotundato-cubicis, in cellulas 2–4 longitudinaliter divisis, intercellularibus, 19–25 μ diam." Newton specimens afforded excellent material of teleutospores. The sori are hypophyllous and only slightly raised above the epidermis. I have in but one instance seen teleutospores on the upper surface of the leaf. The sori vary very much in size, some being very minute with not more than a dozen spores, while the diameter of the larger sori is often as much as 180 μ. The expression, intercellular, as applied to species of *Pucciniastrum* is not altogether clear. In our specimens it is not difficult to see that the beginning of a sorus is beneath a stoma. The mycelium running horizontally in the palisade-cells buds out and produces an ovoid cell, which soon divides into two by a vertical wall and the process is repeated so that, seen from above, the spores are arranged in groups of two and fours. Other buds are formed from the adjoining mycelium and as the mass of the sorus is formed the closing cells of the stoma are torn apart and the sorus is then covered only by the compressed adjacent epidermal cells. It is not clear whether spores borne in this way can be said to be intercellular or not, but it is easy to see the formation of sori beneath the stomata beginning with a single spore or pair of them.

If our plant is to be distinguished from *P. arcticum* it must be by

the characters of the uredo. The pseudoperidium of *P. articum* is described as "mammiformiprominulo, apice pertuso; cellulis apicis pseudoperidii aculeatis." This description applies accurately to the specimen in Vestergren but, if one glances at the figure of Dietel, which is a good representation of our species, the peridium could hardly be said to be even prominently mamillate. The aculeation of the peristomal cells is a character more common in species of *Pucciniastrum* than is generally supposed. When in good condition those cells in *P. Potentillae* Komarov are distinctly aculeate. In short our New England species is distinguished from the type of *P. arcticum* in which, as is shown by Vestergren no. 857, the peridium hardly projects beyond the epidermis, by its markedly conical shape and prominent corona. If we ask what are the variations in American specimens, I can say that after examining a large number of specimens I find a certain difference in the general appearance of the peridia but, except in the specimen from Grand Manan, I find none which agree with the European type. I should regard our fungus, however, not as a distinct species, since in most essential details it agrees with *P. arcticum*, but rather as a geographical variety or, if you please, race in which there is a more marked development of the pseudoperidium. I would to distinguish it give it the name

P. ARCTICUM (Lagh.) Tranzs., var. **americanum** Farlow a *P. arctico* typico pseudoperidio conico-truncato cellulis spinosissimis coronatis distinctum.

Another *Pucciniastrum* very common on *Potentilla tridentata* of which the uredo has often been collected but to which there is scarcely any reference in mycological literature seems to me to be specifically undistinguishable from *P. Potentillae* Komarov. first described from Ninguta, Manchuria, on *P. fragarioides* in Jaczewski, Komarov & Tranzschel, Fungi Rossiae Exsiccati 7, no. 327, 1899. I first found it Sept. 1877 at Eastport and Portland on the Maine coast and since then I have found it on all the higher peaks of the White Mts. and as far south as Mt. Monadnock, N. H., and Berlin Mt. on the boundary between Massachusetts and New York, at Noonmark Mt. in the Adirondacks and I have specimens from White Fish Lake near Duluth collected by F. W. Dewart. It also occurs in Canada and specimens were distributed from Dr. J. Dearness in Fungi Columbiani, no. 2367. Recognizing the resemblance of the uredo to *U.*

Agrimoniae DC., now placed in the genus *Pucciniastrum*, I kept the numerous collections on *Potentilla* next to that species but it was not until a few years ago that I was successful in finding the teleutospores which are not abundant and form small reddish brown spots on the leaves and stipules. The specimen in Fungi Rossiae has only uredosori but they agree with the fungus on *Potentilla*. Probably the species is common wherever *Potentilla tridentata* occurs.

CAMBRIDGE, MASSACHUSETTS.

THE REPRESENTATIVES OF RUMEX SALICIFOLIUS IN EASTERN AMERICA.

M. L. FERNALD.

IN his revisions of the North American species of *Rumex*, Professor Trelease [1] placed together as *R. salicifolius* a vast amount of material with the broad range: "Arctic America across to Alaska, south to New Hampshire, the Great Lakes, and in the mountains to southern California and Mexico, where it closely approaches *R. Mexicanus*." Then, after referring to certain variations of the species as thus interpreted, the author says: "It may be that these forms will bear separation, even from the Old World type; but the (frequently young) specimens in herbaria show as many intermediate forms and admit of so poor a geographical delimitation, that I cannot find good grounds for recognizing more than a single species."

"A more zigzag plant with broad elliptical rather firm leaves (3 × 8 cm.) and one valve almost covered by the very large callosity (1.5 to 2 × 3 to 4 mm.), the other two naked, occurs from Sta. Cruz Mountains .... Sta. Lucia Mountains .... and about San Francisco, Cal..... Others may consider this to be clearly distinct, but I leave it here for the present."

Students of the flora of Western America have recently been inclined to recognize in the aggregate *Rumex salicifolius* a number of

[1] Trelease, Third Ann. Rep. Mo. Bot. Gard. 87 (1892).

apparently distinct species; and since we have in New England and Eastern Canada two clearly separable plants which have been passing as *R. salicifolius* it becomes important to determine what they should be called.

In the first place we must determine what plant Weinmann had before him in describing *Rumex salicifolius*. This is much simpler than would be inferred from Professor Trelease's reference to "the Old World type"; for Weinmann's plant came from California and his description was very obviously based upon the peculiar local plant, with elliptical leaves and "one valve almost covered by the very large callosity, the other two naked", which Professor Trelease singled out from the aggregate as most worthy of separation from *R. salicifolius*. The original description was as follows:

"2. RUMEX SALICIFOLIUS mihi. Floribus dioicis, valvulis integerrimis; unica granifera, foliis oblongo-lanceolatis integerrimis acuminatis subtus glaucescentibus.

Radix perennis et caulis basi interdum lignescens, 2–3 pedalis, ramosus, erectus. Folia petiolata, oblongo-lanceolata, undique attenuata 6–7 uncias longa, sesquiuncias lata. Ochreae tenerrimae semperlacerae. Verticilli congesti multiflori. In California, ♄. ♃." [1]

This Californian plant the true *Rumex salicifolius*, which is well shown in specimens collected by Mr. A. A. Heller on the beach near the Cliff House, San Francisco, June 16, 1902, is very distinct from all the other plants which have been referred to that species not only in its short oblong or elliptical leaves, but in the solitary very large grain of the fruit; and so far as the writer is able to determine from the herbarium material at hand it is confined to the region from San Francisco southward into Monterey County, California.

The very different plant of the New England coast which has been passing under the name *Rumex salicifolius*, the familiar White Dock of our salt marshes and sea beaches, is a somewhat depressed plant, the stems (usually several) more or less reclining or decumbent, finally ascending. Its pale leaves are narrowly lanceolate and elongate, the principal ones measuring 1 to 2 dm. long, 1.3 to 2.5 cm. broad. The lower branches of its mature panicle spread nearly at right angles. Its fruiting calyx is whitish-brown, the valves 3 to 4 mm. long, but slightly exceeding the 3 conspicuous whitish ovoid or lance-ellipsoid

[1] Weinmann, Flora, iv. 28 (1821).

spongy grains (2.5 to 3 × 1 to 2 mm.). This plant which abounds upon sea-coasts of Nova Scotia and eastern New England becomes rather local southward, though it is said to reach the coast of southern New York; and it is gratifying to find it beautifully characterized by our own New England botanist, Jacob Bigelow, in the second edition of the Florula Bostoniensis, as

"* RUMEX PALLIDUS. *White Dock.*

R. foliis lineari-lanceolatis, acutis; spicis gracilibus; valvulis ovatis, integris, granum vix superantibus.

Leaves linear-lanceolate, acute; spikes slender; valves ovate, entire, hardly larger than the grain.

Stems numerous, ascending, smooth, round, slightly furrowed. Leaves smooth, linear-lanceolate, acute, petioled, more or less waved on the margin. Spikes slender, owing to the shortness of the pedicels, the largest with a leaf at base. Calyx linear, acute. Petals ovate, obtuse, erect. Stamens six, anthers whitish, two lobed. Styles three. Fruit crowded, the valves ovate, entire or furnished with a single tooth at base, with a large, white, fleshy, obtuse grain nearly covering the back of each.— Salt marshes.— June.— Perennial.

First sent by Dr. Nichols from Danvers."[1]

The other plant of eastern America which has been passing as *Rumex salicifolius* is more upright and generally taller and greener than *Rumex pallidus*, its leaves somewhat broader (1.5 to 3.5 cm. broad), and its pedicels longer; but its chief distinctions are in the form of its panicle and the size, color, and grains of the fruiting calyx. The branches of the very dense elongate panicle are strict or very strongly ascending, not horizontally spreading as in *R. pallidus*; the valves of the olive-brown or ruddy calyx are 3.5 to 6 mm. long, their tips much exceeding the 2 or 3 narrowly ellipsoid to subulate brown grains (2 to 2.5 × 0.5 to 1.5 mm.); and the achenes are smaller than those of *R. pallidus*. This plant, with the strict inflorescence, darker and longer fruiting calyx and slender grains, replaces *R. pallidus* on the coasts of eastern Quebec, Newfoundland, and Labrador, and extends from sea-level in the East westward to Assiniboia and British Columbia, south very locally to central Maine, Michigan and Missouri; and along the Rocky Mts. at altitudes ranging from 1675 to 2750 meters (5500 to 9000 feet) to central Mexico and even to Mt.

[1] Bigelow, Fl. Bost. ed. 2, 143 (1824).

Orizaba. This is the plant which was described in 1856 by Meisner[1] as *Rumex mexicanus*, a name which may seem doubtfully applicable to a plant which extends into the northern Rocky Mountains and eastward across Canada to the Gulf of St. Lawrence. But this range is in reality a very natural one and it is followed by more than sixty of our best marked northeastern species, such as *Ranunculus Cymbalaria, Rumex persicarioides, Lonicera involucrata, Limosella aquatica, Veronica americana,* &c., which, crossing the boreal district of North America, extend southward along the Rocky Mountain System to northern and central Mexico; and *Chimaphila umbellata, Pyrola secunda, Cystopteris fragilis, Asplenium Trichomanes,* &c., which reach the high summits of Mt. Orizaba or of the Volcan de Fuego in Guatemala, where the last named species is found above 3350 meters (11,000 feet).

GRAY HERBARIUM.

SCIRPUS HUDSONIANUS IN RHODE ISLAND.— On June 22d, while in company with Prof. J. Franklin Collins the writer discovered *Scirpus hudsonianus* (Michx.) Fernald (*Eriophorum alpinum* L.), in a cold bog not far from Diamond Hill in the town of Cumberland. At only one other station known to the writer has this plant been discovered so far south. In RHODORA [1900] Mr. Roland Harper refers to it as occurring at Willington, Connecticut, which is at about the same latitude as the Rhode Island station reported above.— ERNEST SHAW REYNOLDS, Providence, Rhode Island.

[*Scirpus hudsonianus* occurs at a number of stations besides Willington in Tolland County, Connecticut. One of these, Storrs, where the plant was recently found by Professor A. F. Blakeslee, is about twenty miles further south than the Diamond Hill station.— Eds.]

[1] DC. Prodr. xiv. 45 (1856).

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SOME TERATOLOGICAL FORMS OF TRILLIUM UNDULATUM.

WALTER DEANE.

THREE interesting cases of teratological modification have come to my notice in our common Painted Trillium, *T. undulatum*, Willd., perhaps more familiar under the name *T. erythrocarpum*, Michx. Although many monstrosities have been observed in the Trilliums of the northeastern United States, abnormal development in this particular species seems to have been rarely noticed, for a careful search through American botanical journals has brought to light but two authentic records of this kind. It seems fitting, therefore, to record the forms recently observed.

The first case is as follows. The plant grew at Squam Lake, Holderness, New Hampshire, on the grounds of Mr. Edwin DeMeritte, who has a summer camp there. He noticed this Trillium for the first time on August 6 or 7, 1907, and writes that "there were two stems precisely alike growing side by side....in the leaf-mould and scanty soil on a rocky ridge near the lake." One of these specimens Mr. DeMeritte picked and, through the kindness of Mr. William Brewster, presented to the Gray Herbarium, where I have had access to it, as well as to the other specimens to be mentioned later.

The plant was in fruit, which was "well formed and apparently ripe or nearly so, as it had turned red." Unfortunately when the specimen reached Cambridge the fruit and its pedicel were gone, but I am assured that these were normal, the three persistent sepals being present. Mr. DeMeritte writes that the fruit "was at the end of the stem above the upper tier of leaves exactly as when only one tier is found." Whether the petals and stamens were normal it is of

course impossible to say at present, as the plant was not observed in flower. Irregularities of this sort, however, have been shown to be remarkably persistent, and observations will be made during the coming season to determine this point.

The striking abnormality of this plant lies in the fact that, instead of the single whorl of leaves normally present, there are here three such whorls, one above the other, and separated by well developed internodes. Each whorl contains three leaves of normal size and shape. The leaves of the uppermost whorl, which is at the top of the stem, are narrowly ovate, taper-pointed, sessile, and from 7.5 to 9 cm. long. Those of the middle whorl, which is 4.5 cm. below the uppermost, are ovate, taper-pointed, slightly petioled, and 11.5 cm. long. The lowest whorl is 4.8 cm. below the middle one, and its leaves are broadly ovate, taper-pointed, 12.5 to 13.3 cm. long, and borne on petioles 2.5 cm. in length.

A similar teratological formation in the case of *Trillium sessile* has been recorded by Mr. L. S. Hopkins in the Plant World, September, 1902, pp. 182, 183. In the plant there described there were three stems from the same rootstock and one of these "had three whorls of three leaves each. The lower whorls were crowded very closely together, while the upper two were half an inch apart." This peculiarity was accompanied by irregularities in the flower.

A second anomaly in the Painted Trillium is shown by two specimens in the Gray Herbarium. On one sheet are two plants that doubtless grew close together, perhaps from the same rootstock. They were collected by Mr. Swallow at Brunswick, Maine, as indicated in Dr. Gray's handwriting on the sheet. There is no date, but the appearance of the sheet indicates age. The petals and stamens, so far as I can judge, are not of the normal number, but that may well be due to the fact that the plants are passing out of flower, as the fruits are already forming and some of the petals and stamens may have fallen. In this case the abnormality lies in the enormous calyx. In both flowers the sepals are leaf-like, ovate, and taper-pointed, as in the typical leaves, though sessile. In one specimen the sepals are 8.2 cm. long and this greatly enlarged calyx is borne on a pedicel 7.5 cm. long above the leaves, which are normal, being 1 dm. long, on petioles 2.5 cm. in length. In the other specimen the sepals are 9.2 cm. long, the calyx being raised upon a pedicel 3.8 cm. long above the normal leaves, which are 9 cm. long, on petioles 1.3 cm. in length.

On another sheet in the Gray Herbarium I find the third unrecorded instance of teratology in the species in question. The specimen was collected in Fitzwilliam, New Hampshire, in May, 1891, by Miss K. L. Kimball. In this plant the leaves, sepals, petals, and styles are in fours. There are seven stamens but there was probably an additional one originally.

In the Plant World for April, 1903, p. 89, Mr. E. L. Morris states that abnormalities in *Trillium undulatum* "have been noted by the Macouns, father and son." In regard to this Mr. J. M. Macoun writes me that "neither my father nor I have ever noted teratology in *T. undulatum*," so there must have been some misunderstanding in regard to the matter.

Two other records deserve mention. In RHODORA for February, 1905, p. 40, Mr. Frederick S. Beattie says, "I collected a specimen of this [*T. undulatum*] on May 21 in Gloucester which possessed two stems proceeding from the same corm. Furthermore, on the flower of one of the two twin-stems, one of the sepals was enlarged to a length five-sixths that of the ordinary leaves, the shape of this sepal also approximating that of a leaf, rather than that of a sepal."

In the American Journal of Science and Arts, 3d series, vol. XV, February, 1878, p. 153, Dr. Asa Gray says, "Pastor Wibbe also sends a polymerous state of *Trillium erythrocarpum*. Something of the kind not rarely occurs in *Trillium*. This plant, which has been constant since discovered five years ago, has all the parts from leaves to carpels regularly increased (in the leaves apparently by chorisis) from three to nine, except that the stamens hardly keep up to double the number of the petals." Doubtless the very specimen referred to is the one that I find in the Gray Herbarium. It is labelled in Dr. Gray's handwriting, "T. erythrocarpum — 8-merous — Lily Marsh near Oswego, N. Y.— J. H. Wibbe — 1877." A careful examination of the plant, however, shows a discrepancy between the number of parts and the description as quoted above, the statement on the label being more nearly correct. There are eight sepals and eight petals and all these are normal with the exception of one sepal which has a white petaloid growth on one side. There are at least 20 stamens and on the side of the pistil that is visible there are six carpellary divisions of the ovary. The leaves are in a whorl at the top of the stem and are seven in number, but the 8-merous character is shown by the fact that one of the leaves is double. It has two midribs and is forked at the tip, the sinus between the two apices being half an inch deep.

The genus *Trillium* seems peculiarly subject to departures from the normal type and cases without number, affecting every part of the plant, have been recorded in our journals. A perusal of these shows how infinite are the combinations of abnormalities that can be found in individual plants. Various whorls of leaves of different shapes, some long-petioled and rising from the base of the stem, sepals white, petals green and petioled, ovary stalked, leaves and various parts of the flower wanting — these are but a few of the manifold changes that the various species of *Trillium* are subject to. Teratology is of great assistance in teaching us the morphology of the plant and hence is a study of much importance. It is hoped that due record will be made of the discovery of any new instance of variation in *Trillium undulatum*.

CAMBRIDGE, MASSACHUSETTS.

THE NEW ENGLAND SPECIES OF PSEDERA.

ALFRED REHDER.

ANOTHER old name has come to light to replace one of our well known generic names, for there is no doubt that we must on the ground of priority substitute the name *Psedera*[1] of Necker (Elem. Bot. 1:158. 1790) for *Parthenocissus* and also for *Ampelopsis* if we consider *Ampelopsis quinquefolia* as belonging to the latter genus. Greene, who seems to have studied very thoroughly Necker's much neglected and misunderstood work, has recently drawn attention to the fact that Necker's *Psedera* usually referred as a doubtful genus to the *Araliaceae* represents a genus based on *Hedera quinquefolia* of Linnaeus. Aside from his description the statement of Necker that the genus is based on a species of *Hedera* Linnaeus places Greene's identification beyond doubt, for Linnaeus describes only two species, *Hedera Helix* and *H. quinquefolia*, of which the second agrees exactly with Necker's description of his *Psedera*. The acceptation of this name

[1] The name is apparently shortened from *Pseudohedera*, which refers to the fact that its type had been first described as a species of *Hedera*.

relieves us of two other vexing nomenclatorial questions, the fixing of the type of *Ampelopsis* Michaux and the question whether *Quinaria* of Rafinesque should supersede *Parthenocissus* of Planchon. It will be remembered that *Ampelopsis* was published by Michaux (Fl. Bor. Am. **1**:159. 1803) with three species without indication as to which one he considered the type of the genus. Torrey & Gray (Fl. N. Am. **1**:245. 1838) took *Ampelopsis quinquefolia* as the type and referred the other species to *Vitis*, but 8 years before Rafinesque (Am. Man. Grape Vin. 6. 1830) had made *Ampelopsis quinquefolia* the type of his new genus *Quinaria*. Objections in regard to the validity of this name have been raised in account of an older homonym, Loureiro's *Quinaria* of 1790, which, however, is identical with *Cookia* Sonnerat of 1782, both being based on the same species, and therefore the older homonym being non-valid would not prohibit the use of *Quinaria* of Rafinesque. *Quinaria* and *Parthenocissus* will now become simple synonyms of *Psedera*, while *Ampelopsis* will also disappear as a genus, if *Ampelopsis cordata* and its allies are not considered as constituting a distinct genus; as it is hardly possible to separate them from *Cissus* by any constant and reliable characters, it seems best not to retain *Ampelopsis* as a genus.

Two species of *Psedera* occur in New England:[1]

PSEDERA QUINQUEFOLIA Greene, Leafl. Bot. Observ. **1**:220. 1906. — *Hedera quinquefolia* Linnaeus, Sp. Pl. 202. 1753.— *Vitis quinquefolia* Lamarck, Ill. **2**:135. 1793.— *Ampelopsis quinquefolia* Michaux, Fl. Bor. Am. **1**:160. 1803.—*Cissus hederacea* Persoon, Syn. **1**:143. 1805.— *Quinaria hederacea* Rafinesque, Am. Man. Grape Vin. 6. 1830.— *Parthenocissus quinquefolia* Planchon, De Candolle Monogr. Phan. **5**:448. 1887. High climbing shrub fastening itself by the disks of its tendrils to the support. Leaf-buds in spring and the young branchlets at the tips light red. Tendrils with 5 to 8 disk-bearing ramifications. Leaves long-petioled, 5-foliolate or occasionally 3-foliolate; leaflets ovate to ovate-oblong, 5 to 10 cm. long, acuminate, usually narrowed at the base, coarsely and usually crenately serrate, dull green above, glaucescent beneath, usually of thickish texture. Flowers on slender pedicels in 3- to 6-flowered umbels terminating the ramifications of the unequally dichotomous or thyrsoidal corymbs usually crowded at the end of the branchlets and forming leafy panicles.

[1] For fuller citation of the synonymy see Rehder, Sargent's Trees & Shrubs **1**: 183–190, (1905) and Mitteil. Deutsch. Dendr. Ges. **14**: 129–136 (1905).

Fruits globose, 5 to 7 mm. thick, bluish black, and with slight bloom, seeds usually 2 or 3, with an orbicular or sometimes obovate chalaza. Flowers from the middle of July to the end of August. NEW HAMPSHIRE: Seabrook, Aug. 7, 1898, *E. F. Williams*. VERMONT: Burlington, Aug. 4, 1902, *A. Rehder*; Middlebury, July 7, 1878, and Sept. 30, 1880, *E. Brainerd*. MASSACHUSETTS: Amherst, August 15, 1902, *A. Rehder*; Blue Hills, Sept. 1, 1895, *W. H. Manning*, Sept. 9, 1905 *J. R. Churchill*; Cohasset, Aug. 4, 1902, *J. G. Jack*; Medford, July 31, *Wm. Boott*; Revere, Aug. 30, *E. F. Williams*; Oak Island, Revere July 16, 1882, *H. A. Young*; Lynn, May 23, 1903, *A. Rehder*; Cape Cod, Centreville, Aug. 11, 1903, *Clara I. Cheney*. RHODE ISLAND: Tiverton, Aug. 1879, *C. S. Sargent*. CONNECTICUT: Southington, July 17, 1898, *L. Andrews*. Distributed west to New York, Ohio, Indiana, Illinois and Missouri, south to Florida and Mexico.

PSEDERA QUINQUEFOLIA var. **hirsuta**, n. comb.— *Cissus hederacea β. hirsuta* Pursh, Fl. Am. Sept. 1:170. 1814.— *Ampelopsis hirsuta* [Donn, Cat. Hort. Cantabr. ed. 2. 50. 1802, nomen nudum] Roemer & Schultes, Syst. 5:321. 1819.— *Quinaria hirsuta* Rafinesque, Am. Man. Grape Vin. 6. 1830.— *Ampelopsis Graebneri* Bolle, Gartenfl. 48:257, tab. 1462. 1899.— *Parthenocissus hirsuta* Small, Fl. S. E. U. S. 758. 1903.— *Psedera hirsuta* Greene, Leafl. Bot. Observ. 1:220. 1906.— Differs from the type in the pubescence, which is found in specimens typical for the variety on almost all parts of the plant, while toward its northern range of distribution they are apt to become glabrescent and are sometimes only pubescent on the young shoots as are specimens seen from Middlebury and Burlington, Vt. The young shoots are usually of a brighter red than in the type and the seeds are somewhat larger, more lustrous and have a usually obovate chalaza. VERMONT: Burlington, Aug. 4, 1902, *A. Rehder*; Middlebury, Sept. 1, 1902, *E. Brainerd*. MASSACHUSETTS: Amherst, Aug. 15, 1902, *A. Rehder*. Distributed from Ontario (Dr. Wm. Macoun, orally) through western New England and along the western slope of the Alleghany mountains through New Mexico to Mexico. In the North this variety very rarely flowers and fruits, which suggests that it is not at home there, but probably introduced from the south by birds migrating north; many birds seem to be fond of the berries of *Psedera*.

The following varieties are sometimes met with in cultivation but are not found wild in New England:

PSEDERA QUINQUEFOLIA var. **murorum**, n. comb.— *Ampelopsis latifolia* Tausch, Flora **21**:738. 1838.— *Ampelopsis hederacea* var. *murorum* Focke, Abh. Naturw. Ver. Bremen **4**:560. 1875. A southern form distinguished from the type by its more numerous, usually 8 to 12 ramifications of the tendrils and the broader leaflets.

PSEDERA QUINQUEFOLIA var. **minor**, n. comb.— *Parthenocissus radicantissima* var. *minor* Graebner, Gartenfl. **49**:286. 1900. This is apparently a form of the proceeding variety and differs from it only in its smaller and broader, oval to orbicular-ovate, more slender-petioluled leaflets.

PSEDERA QUINQUEFOLIA var. **Saint-Paulii**, n. comb.— *Parthenocissus Saint-Paulii* Graebner, Gartenfl. **49**:283. 1900.— *Ampelopsis Saint-Paulii* Mottet, Rev. Hort. **79**:567. 1907. A variety occurring in Iowa, Illinois, Missouri and Texas; differing from the type in the tendrils having 8 to 12 ramifications and in the elliptic to obovate leaflets gradually narrowed into a very short petiolule and pubescent beneath like the branchlets; it has more than any other variety the tendency to form aerial rootlets.

PSEDERA VITACEA Greene, Leafl. Bot. Observ. **1**:220. 1906.— *Cissus quinquèfolia* Sims. Bot. Mag. **51**: tab. 2443. 1824.— *Ampelopsis hederacea* var. *dumetorum* Focke, Abh. Naturw. Ver. Bremen. **4**:559. 1875.— *Quinaria quinquefolia* Koehne, Gartenfl. **41**:402. 1892, not Rafinesque.— *Parthenocissus laciniata* Small, Fl. S. E. U. S. 759. 1905. A climbing shrub usually low and rambling over bushes, but occasionally climbing high into trees, fastening itself by the twining ramifications of the tendrils; branchlets like the leaf-buds green while young, distinctly swollen at the joints, branches always without aerial rootlets; tendrils with 3 to 5 slender twining ramifications without disks. Leaves long-petioled, 5- or occasionally 3-foliolate, leaflets oval to ovate-oblong, acuminate, usually narrowed at the base, coarsely serrate or incisely serrate with the teeth often spreading, bright or dark green and lustrous above, lighter green and lustrous beneath, glabrous or sparingly pubescent on the midrib beneath. Corymbs glabrous, on slender peduncles, opposite to the leaves and solitary, distinctly dichotomously branched, with usually elongated ramifications, 5 to 7 cm. broad. Berries subglobose, 6 to 8 mm. thick, bluish black without or with slight bloom; seeds usually 3 or 4, with an oval or obovate chalaza. Flowers from the end of June to the end of July. MAINE: Hartford, *J. C. Parlin*; Piscataquis River

valley, Foxcroft, July 17, 1895, *M. L. Fernald*. NEW HAMPSHIRE: Winchester, Aug. 1, 1898, *B. L. Robinson*. VERMONT: Charlotte, July 6 and October 11, 1879, *C. G. Pringle*; Manchester, Aug. 1, 1898, *M. A. Day*; Pownal, banks of Hoosic River, June 27, 1904, *J. R. Churchill, A. Rehder*. The specimens from Winchester are not typical but suggest a possible hybrid between *Psedera vitacea* and *P. quinquefolia*. Distributed from eastern Canada and New England through northern New York and the Great Lake region to Manitoba, Montana, Wyoming, Utah, Arizona, New Mexico, Texas, Kansas and Iowa.

The following varieties and forms can be distinguished:

PSEDERA VITACEA forma **macrophylla**, n. comb.— *Vitis quinquefolia* var. *macrophylla* Lauche, Deutsch. Dendr. 470. 1880.— *Ampelopsis quinquefolia* b. *latifolia* Dippel. Handb. Laubholzk. **2**:474. 1892. This is only a garden form with large leaves, the leaflets being sometimes up to 10 cm. broad.

PSEDERA VITACEA var. **dubia**, n. comb.— *Parthenocissus hirsuta* Graebner, Gartenfl. **49**: 251. 1900.— *Parthenocissus vitacea* var. *dubia* Rehder, Mitt. Deutsch. Dendr. Ges. **14**:135. 1905. This is a somewhat doubtful form; it differs from the type in the usually rather sparse hairiness of the young branchlets and the under side of the leaves. I have never seen a specimen which agrees exactly with Graebner's description; the specimen upon which he based his description and supposed to be from the Eastern States could not be found in the Herbarium of the Berlin Botanical Museum, as I was looking there for it. Cultivated forms named by Dr. Graebner *P. hirsuta* show but a slight pubescence and suggest a hybrid between *Psedera vitacea* and *P. quinquefolia* var. *hirsuta*.

PSEDERA VITACEA var. **laciniata**, n. comb.— *Parthenocissus quinquefolia* δ *laciniata* Planchon in De Candolle, Monogr. Phan. **5**:449. 1887.— *Psedera laciniata* Greene, Leafl. Bot. Observ. **1**:220. 1906. This is the Rocky Mountain form and occurs in Wyoming, Colorado, Utah, Arizona and New Mexico. It differs from the type in its smaller, narrower and incisely serrate leaflets and their usually pale yellowish green color.

Besides these two species only one more occurs in North America; this is **Psedera heptaphylla**, n. comb.— *Ampelopsis heptaphylla* Buckley, Proc. Philad. Acad. 1861:450.— *Vitis hederacea* var. *texana* Buckley ex Durand, Bull. Soc. Acclim. Paris **9**:486. 1862.— *Psedera*

texana Greene, Leafl. Bot. Observ. 1:220. 1906. Occurs in Texas and is easily distinguished from *P. vitacea* by its 6- to 7-foliolate leaves.

Of the foreign species only the well known "Boston Ivy," so extensively planted for the covering of walls and buildings, need to be mentioned here; it is **Psedera tricuspidata**, n. comb.— *Ampelopsis tricuspidata*, Siebold & Zuccarini, Abh. Akad. Wiss. Muench. 4:88. 1846.— *Parthenocissus tricuspidata* Planchon, De Candolle Monogr. Phan. 5:452. 1887.— *Ampelopsis Veitchii* Hort. This species differs from its American congeners in having partly three-lobed and partly 3-foliolate leaves. As it flowers and fruits freely in southern New England, it may possibly soon become naturalized and carried even to localities remote from settlements through the agency of birds which are often seen feeding on the berries.

Arnold Arboretum.

NOTES ON THE VASCULAR PLANTS OF THE NORTHEASTERN UNITED STATES.

B. L. Robinson.

In the course of work at the Gray Herbarium, it has been necessary, during the last few months, to assign new names to a considerable number of plants (many of them minor varieties and forms), which, either from changed views regarding their proper classification or more often from the provisions of the Vienna Rules of Botanical Nomenclature, can no longer be accurately designated by previously existing names and combinations. As the new combinations needful must from time to time be employed in the identification of specimens for persons preparing local floras or otherwise desirous to mention such names in publication, it seems best to record them here briefly with the explanatory synonymy.

Asplenium platyneuron (L.) Oakes, var. **incisum** (E. C. Howe), n. comb. *A. ebeneum* Ait., var. *incisum* E. C. Howe, Ann. Rep. Regents Univ. N. Y. xxii. 104 (1869); Gordinier & Howe, Fl. Rensse-

laer Co., N. Y., 38 (1894). *A. ebeneum* Ait., var. *Hortonae* Davenp. RHODORA, iii. 1, t. 22 (1901).— On noticing the close correspondence of characters given by Dr. E. C. Howe for var. *incisum* and those of Mr. Davenport's var. *Hortonae*, the writer applied to Prof. Charles H. Peck for further information regarding the New York plant. Prof. Peck kindly supplied further details as to the type specimen of var. *incisum* and sent a tracing of one of its fronds. From the information thus gained it appears certain that the two varieties are identical. The older name is of course to be maintained under the altered specific name. This attractive plumose variety of *A. platyneuron* has been reported at isolated stations from Vermont to Maryland, Missouri, and Arkansas.

ASPIDIUM GOLDIANUM Hook., var. **celsum** (Palmer), n. comb. *Dryopteris Goldieana*, subsp. *celsum* Palmer, Proc. Biol. Soc. Wash. xiii. 65, t. 1 (1899). The Vienna Rules are unhappily incomplete as to the Pteridophytes. This large group of plants, as well as the Bryophytes and Thallophytes, was not covered by the list of nomina conservanda. However, a note from Article 9 states explicitly that "lists of nomina conservanda for all divisions of plants other than Phanerogams" are subject to consideration at the Congress of 1910. Under these circumstances it seems unwise to abandon such well established generic names as *Aspidium* or to take up hurriedly in their place names like *Dryopteris*, which are precisely parallel to many which in the case of the flowering plants it has seemed best to discard.

Woodsia Cathcartiana, n. sp. *W. scopulinae* affinis et simillima, sed minute glanduloso-puberula nec hispidula; frondibus 2–3 dm. altis obscure viridibus firmiusculis lanceolatis 25–55 mm. latis bipinnatifidis; pinnis oblongis, inferioribus distantibus, lobis sinubus modice latis separatis oblongis denticulatis; soris submarginalibus; indusio obscuro eo *W. scopulinae* simile.— *W. scopulina* D. C. Eaton apud Gray, Man. ed. 6, 691 (1890), non D. C. Eaton, Can. Nat. ii. 90 (1865).— Nearly related and very similar to *W. scopulina*, but minutely glandular-puberulent, not hispidulous; fronds 2–3 dm. high, dull green, rather firm in texture, lanceolate, 25–55 mm. wide, bipinnatifid; pinnae oblong, the lower distant; lobes oblong, denticulate, separated by rather wide sinuses; sori submarginal; indusium obscure, similar to that of *W. scopulina*.— Taylor's Falls of the St. Croix River, Minnesota, 1874, *Miss Ellen Cathcart* (type, in hb. Gray); also on rocks, Lower Falls of the Menomine River, Michigan, 31 August, 1892, *C.*

F. Wheeler. This species was sent to Dr. Gray soon after its original collection. It was referred by him to Prof. Eaton, who evidently was somewhat puzzled by it. He reported it as belonging to his *W. scopulina* remarking, however, upon its peculiar glandular puberulence. Much additional material of the real *W. scopulina*, a species frequent from the Rocky Mountains westward, is now at hand and the constancy of the distinctions pointed out above is such as to warrant the publication of the plant of Minnesota and Michigan as a separate species.

SAGITTARIA LATIFOLIA Willd., forma **obtusa** (Muhl.), n. comb. *S. obtusa* Muhl. Cat. 86 (1813). *S. variabilis*, var. *obtusa* Engelm. apud Gray, Man. ed. 5, 493 (1867).

SAGITTARIA LATIFOLIA Willd., forma **gracilis** (Pursh), n. comb. *S. gracilis* Pursh, Fl. ii. 396 (1814). *S. variabilis*, var. *gracilis* Engelm. l. c.

SAGITTARIA LATIFOLIA Willd., forma **diversifolia** (Engelm.), n. comb. *S. variabilis*, var. *diversifolia* Engelm. l. c.

LOPHOTOCARPUS CALYCINUS J. G. Smith, var. **maximus** (Engelm.), n. comb. *Sagittaria calycina*, var. *maxima* Engelm. apud Torr. Bot. Mex. Bound. 212 (1859).

Camassia esculenta (Ker), n. comb. *Scilla esculenta* Ker, Bot. Mag. t. 1574 (1813). *C. Fraseri* Torr. Pacif. R. Rep. iv. 147 (1856). *Quamassia esculenta* Coville, Proc. Biol. Soc. Wash. xi. 65 (1897), where detailed and critical synonymy may be found. *Q. hyacinthina* Britton, Ill. Fl. i. 423 (1896).— It is to be carefully noted that the plant here called *C. esculenta*, dating back to the synonym of Ker (1813) is quite distinct from the *C. esculenta* of Lindley, a larger-flowered species of the Northwest, which, dating back merely to the synonym *Quamasia esculenta* Raf. Am. Month. Mag. ii. 265 (1818), must take the name *Camassia quamash* (Pursh) Greene, Man. Bay Reg. 313 (1894), a combination derived from the earlier *Phalangium quamash* Pursh, Fl. Am. Sept. i. 226 (1814).

Oxybaphus linearis (Pursh), n. comb. *Allionia linearis* Pursh, Fl. 728 (1814). *Oxybaphus angustifolius* Sweet, Hort. Brit. ed. 2, 429 (1830). *Allionia Bushii* Britton, Bull. Torr. Bot. Club, xxii. 223 (1895).

POLYGONUM DUMETORUM, L., forma **cristatum** (Engelm. & Gray), n. comb. *P. cristatum* Engelm. & Gray, Journ. Bost. Soc. Nat. Hist. v. 259 (p. 51 of the reprint), 1845.— Repeated examinations of many

specimens of *P. dumetorum* and *P. cristatum* have failed to show other differences than the slight and inconstant toothing of the wings of the fruiting calyx.

ACNIDA TUBERCULATA Moq., var. **prostrata** (Uline & Bray), n. comb. *A. tamariscina*, var. *prostrata* Uline & Bray, Bot. Gaz. xx. 158 (1895).

AMARANTHUS HYBRIDUS L., var. **hypochondriacus** (L.), n. comb. *A. hypochondriacus* L. Spec. Pl. 991 (1753).

CARYA GLABRA (Mill.) Spach, var. **villosa** (Sarg.), n. comb. *Hicoria glabra*, var. *villosa* Sarg. Silv. vii. 167 (1895). *H. villosa* Ashe, Bull. Torr. Bot. Club, xxiv. 481 (1897).

ASARUM CANADENSE L., var. **reflexum** (Bicknell), n. comb. *A. reflexum* Bicknell, Bull. Torr. Bot. Club, xxiv. 531, 533, t. 317 (1897). — Repeated efforts to find constant distinctions between *A. canadense* and the sometimes well marked *A. reflexum* have failed, and it appears that the latter plant is more naturally classed as a variety of the former.

RADICULA OBTUSA (Nutt.) Greene, var. **sphaerocarpum** (Gray), n. comb. *Nasturtium sphaerocarpum* Gray, Mem. Am. Acad. iv. 6 (1849). *Roripa sphaerocarpa* Britton, Mem. Torr. Bot. Club, v. 170 (1894). — In taking up the old generic name *Radicula* for the genus which has long passed as *Nasturtium*, the writer merely follows the course rendered necessary by the Vienna Rules. It is one of several cases, happily rather few, where from apparent oversight the list of nomina conservanda was not made sufficiently complete to guard against awkward change.

RADICULA PALUSTRIS Moench, var. **hispida** (Desv.), n. comb. *Brachylobus hispidus* Desv. Journ. Bot. iii. 183 (1814). *Nasturtium hispidum* DC. Syst. Veg. ii. 201 (1821). *N. palustre*, var. *hispidum* Gray, Man. ed. 2, 30 (1856). *Roripa hispida* Britton, Mem. Torr. Bot. Club, v. 169 (1894).

Radicula aquatica (Eaton), n. comb. *Cochlearia aquatica* Eaton, Man. ed. 5, 181 (1829). *Roripa americana* Britton, Mem. Torr. Bot. Club, v. 169 (1894). *Nasturtium lacustre* Gray, Gen. Ill. i. 132 (1848).

Radicula Armoracia (L.), n. comb. *Cochlearia Armoracia* L. Spec. Pl. 648 (1753). *Nasturtium Armoracia* Fries, Fl. Scan. 65 (1835). *Roripa Armoracia* Hitchc. Spring Fl. Manhattan, 18 (1894).

PHYSOCARPUS OPULIFOLIUS (L.) Maxim., var. **intermedius** (Rydberg), n. comb. *Opulaster intermedius* Rydberg, apud Britton, Man. 492 (1901).

PYRUS ARBUTIFOLIA L. f., var. **atropurpurea** (Britton), n. comb. *Aronia atropurpurea* Britton, Man. 517 (1901).

AMELANCHIER OBLONGIFOLIA Roem., var. **micropetala**, n. var., fruticosa suberecta plus minusve ramosa, saepissime 2–9 dm. alta, foliis, pubescentia, etc., formae typicae omnino simillima, sed floribus multo minoribus, petalis vix conspicuis linearibus vel oblanceolato-oblongis, vel spatulatis calycem paulo superantibus.— Branching shrub, suberect, usually 2–6 dm. high, in leaves, pubescence, etc., closely similar to the typical form, but with much smaller flowers, the petals scarcely conspicuous, linear, oblanceolate-oblong, or spatulate, 3–4 mm. long, 1–1.5 mm. wide, scarcely surpassing the calyx.— MASSACHUSETTS: on ledges, toward the summit of Blue Hill, Milton, *G. G. Kennedy & M. L. Fernald*, 7 May, 1899 (type, in hb. Gray), *Bartlett*, no. 846, 14 July, 1907 (hb. Gray); moors, Nantucket, *J. R. Churchill*, 30 May, 1904 (hb. Gray): CONNECTICUT: thin soil on ledge of rocks, Oxford, *E. B. Harger*, 12 May and 7 June, 1901 (hb. Gray); dry ground, Alewive Cove, Waterford, *C. B. Graves*, 20 May and 3 July, 1901 (hb. Gray); dry sandy soil, Southington, *C. H. Bissell*, 12 May and June 13, 1901. This low small-flowered plant is strikingly different in its small petals from the common and typical form of the species, but intermediates have already been observed at several stations, as for instance at Wilmington, Massachusetts, by Mr. Hollis Webster, which seem fully to justify the view that the smaller-flowered form is merely a variety of the larger.

ACACIA ANGUSTISSIMA (Mill.) Ktze., var. **hirta** (Nutt.), n. comb. *A. hirta* Nutt. in Torr. & Gray, Fl. i. 404 (1840). *A. filicoides* Trelease ex Branner & Coville, Rep. Geol. Surv. Ark. 1888, pt. 4, 178 (1891), and *A. filiculoides* Trelease ex Britton, Ill. Fl. ii. 254 (1897), as to plant, not as to synonymy.

Astragalus eucosmus, n. nom. *A. orobioides*, var. *americanus* Gray, Proc. Am. Acad. vi. 205 (1864). *Phaca parviflora* Nutt. ex Torr. & Gray, i. 348 (1838), not *A. parviflorus* (Pursh) MacMillan. *P. elegans* Hook. Fl. Bor. Am. i. 144 (1830). *A. elegans* Sheldon, Minn. Bot. Stud. i. 154 (1894); Britton in Britton & Brown, Ill. Fl. ii. 303 (1897), not Bunge, Sp. Astrag. Geront. ii. 89 (1869).

DESMODIUM CANESCENS (L.) DC., var. **hirsutum** (Hook.), n. comb. *D. canadensis*, var. *hirsuta* Hook. Comp. Bot. Mag. i. 23 (1835). *D. canescens*, var. *villosissimum* Torr. &. Gray, Fl. i. 365 (1838). *Meibomia canescens*, var. *hirsuta* Vail, Bull. Torr. Bot. Club, xix. 111 (1892).

DESMODIUM BRACTEOSUM (Michx.) DC., var. **longifolium** (Torr. & Gray), n. comb. *D. canadense*, var. *longifolium* Torr. &. Gray, Fl. i. 365 (1838). *Meibomia longifolia* Vail, Bull. Torr. Bot. Club, xxiii. 140 (1896).

ILEX OPACA Ait., forma **xanthocarpa**, n. f., formae typicae omnino simillima sed drupis laete flavis.— Quite like the typical form but with bright yellow drupes.— Near New Bedford, Massachusetts, where discovered by Mr. E. Williams Hervey, in the autumn of 1900 (type, in hb. Gray).

ILEX LAEVIGATA (Pursh) Gray, forma **Herveyi**, n. f., omnino ut forma typica sed drupis laete flavis.— Altogether like the typical form, but the drupes bright yellow.— Near the pumping station, Little Quittacus Lake, Lakeville, Massachusetts, 22 October, 1900, *E. W. Hervey* (type, in hb. Gray).

LECHEA INTERMEDIA Læggett, var. **juniperina** (Bicknell), n. comb. *L. juniperina* Bicknell, Bull. Torr. Bot. Club, xxiv. 88 (1897).

LECHEA MARITIMA Læggett, var. **interior**, n. var., quam forma typica paulo gracilior laxius ramosa viridior; foliis tenuioribus; pedicellis filiformibus 2–3 mm. longis.— A little more slender than the typical form, more loosely branched, and greener; leaves thinner; pedicels threadlike, 2–3 mm. long.— Dry soil, Troy, N. H., 11 September, 1897, *B. L. Robinson*, no. 588 (type, in hb. Gray). This variety is proposed to cover a puzzling, by no means rare, inland phase of *L. maritima*, in many ways simulating *L. intermedia* yet showing the pyramidal branching and slightly smaller fruit of the former species.

OENOTHERA MURICATA L., var. **canescens** (Torr. & Gray), n. comb. *O. biennis*, var. *canescens* Torr. & Gray, Fl. i. 492 (1840).

OENOTHERA LACINIATA Hill, var. **grandiflora** (Wats.), n. comb. *O. sinuata*, var. *grandiflora* Wats. Proc. Am. Acad. viii. 581 (1873). *O. laciniata*, var. *grandis* Britton, Mem. Torr. Bot. Club, v. 358 (1894).

OENOTHERA LINEARIS Michx., var. **Eamesii**, n. var., decumbens; foliis ellipticis, majoribus 2.7 cm. longis, 1.1 cm. latis.— Decumbent; leaves elliptical, the larger 2.7 cm. long, 1.1 cm. wider.— Sandy shore of a salt pond Stratford, Connecticut, *E. H. Eames* (type, hb. Gray).

Oenothera longipedicellata (Small), n. comb. *Kneiffia longipedicellata* Small, Bull. Torr. Bot. Club, xxiii. 178 (1896).

Oenothera pratensis (Small), n. comb. *Kneiffia pratensis* Small, Fl. S. E. U. S. 842, 1335 (1903).

Spermolepis patens (Nutt.), n. comb. *Leptocaulis patens* Nutt.

ex DC. Prodr. iv. 107 (1830). *Apiastrum patens* Coult. & Rose, Rev. Umbell. 110 (1888).

RHUS GLABRA L., forma **laciniata** (Carr.), n. comb. *R. glabra*, var. *laciniata* Carr. Rev. Hort. 1863, p. 7.

OXYPOLIS RIGIDIOR Coult. & Rose, var. **ambigua** (Nutt.), n. comb. *Oenanthe ambigua* Nutt. Gen. i. 189 (1818). *Sium longifolium* Pursh, Fl. 194 (1814). *Archemora rigida rigida*, var. *ambigua* Wood, Class-Book, 380 (1861). *Archemora ambigua* DC. iv. 188 (1830). *Tiedemannia rigida*, var. *ambigua* Coult. & Rose, Rev. Umbell. 47 (1888). *Oxypolis rigidus*, var. *longifolius* Britton, Mem. Torr. Bot. Club, v. 339 (1894).— It is to be noticed in regard to this combination that the specific name should retain its earlier form, *rigidior*, and not be changed as by several recent writers to the positive degree. The restoration of the varietal name *ambigua* is necessitated by Art. 48 of the Vienna Rules and rests upon the fact that *ambigua*, not *longifolia*, was the name first applied to this plant in the varietal category.

Bartonia paniculata (Michx.), n. comb. *Centaurella paniculata* Michx. Fl. i. 98, t. 12, f. 1 (1803). *C. Moseri* Steud. & Hochst. ex Griseb. Gen. et Spec. Gent. 308 (1839). *Bartonia lanceolata* Small, Fl. S. E. U. S. 932 (1903).

GERARDIA GRANDIFLORA Benth., var. **serrata** (Torr.), n. comb. *G. serrata* Torr. ex Benth. in DC. Prodr. x. 521 (1846). *Dasystoma Drummondi*, var. *serrata* Benth. l. c. *G. grandiflora*, var. *integriuscula* Gray, Syn. Fl. ii. pt. 1, 291 (1878). *Dasystoma serrata* Small Bull. Torr. Bot. Club, xxviii. 451 (1901).

THE DISCOVERY OF CRYPTOGRAMMA STELLERI IN MAINE.— *Cryptogramma Stelleri* (Gmel.) Prantl (*Pellaea gracilis* Hook.) has not been reported, I believe, from Maine. On July 29, 1906, I found it growing in abundance at Berry Ledge in West Paris. The plants were not on limestone, but upon a coarse granitic formation. When acid was applied to the rock, however, it caused effervescence, showing the presence of lime in the rock.— WALTER L. BACON, Norway, Maine.

TWO ADDITIONS TO THE LICHEN FLORA OF THE BLUE HILLS.— I have found lately in my herbarium the following species of lichens

which are not included in the "Flora of the Blue Hills, Middlesex Fells, Stony Brook and Beaver Brook Reservations, of the Metropolitan Park Commission" of 1896, compiled and edited by Mr. Walter Deane. The species are in no way remarkable, but are perhaps worthy of record as additions to a published flora.

1. *Parmelia caperata* (L.) Ach. One specimen from Chickatawbut Hill, Oct. 7, 1906, collected by Miss E. C. Barker, and one specimen from Great Blue Hill, May 18, 1907, collected by Mrs. G. S. Parker.

2. *Umbilicaria Muhlenbergii* (Ach.) Tuckerm. Two specimens, data as above.— R. HEBER HOWE, JR., Thoreau Museum, Concord, Massachusetts.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,— XV. ADDENDA. — To a preliminary check-list of New England *Loranthaceae, Euphorbiaceae*, and certain other families, published in RHODORA, vi. 85–88, the following additions have been made, which may now be indicated with a + sign in the proper columns in the list, since through the kindness of Professor J. F. Collins, Dr. E. H. Eames, and the late J. A. Wheeler, Esq., specimens of all have been examined by the writer and are in his herbarium.

Arceuthobium pusillum Peck. RHODE ISLAND: Bowdish Reservoir, Glocester, 19 May, 1904, *J. F. Collins*. See RHODORA, vi. 150.

Crotonopsis linearis Michx. CONNECTICUT: Milford, 30 August, 1907, *E. H. Eames*, no. 5876.

Euphorbia Lathyris L. CONNECTICUT: Bridgeport, 2 August, 1897, *E. H. Eames*. By oversight in copying omitted from the former list.

Euphorbia Preslii Guss. NEW HAMPSHIRE: Meredith Neck, August, 1894, *Mrs. L. A. Carter*; Milford, 5 September, 1902, *J. A. Wheeler*.— ARTHUR STANLEY PEASE, Cambridge, Massachusetts.

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THE NEW ENGLAND BOTANICAL CLUB

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SOME MOSSES FROM AROOSTOOK COUNTY, MAINE.

J. Franklin Collins.

A very interesting small packet of mosses, collected in Caribou Bog at Crystal in southern Aroostook County, Maine, by Professor and Mrs. M. L. Fernald, was recently handed to me for determination. It contained one species of *Sphagnum*, one hepatic, and four true mosses. The *Sphagnum* is *S. teres* Ångstr., a moss of wide distribution in northern Eurasia and North America, having been recorded on this continent at various places from Labrador to British Columbia, and southward to New England and New Jersey, including Maine.

The hepatic has been determined by Dr. Evans. He writes "Your hepatic from Maine (5351) is a slender form of *Riccardia pinguis* (L.) S. F. Gray. I have not before seen it from this state." It has previously been reported in New England from New Hampshire, Vermont, Rhode Island, and Connecticut.

The four species of true mosses have not, so far as the writer knows, been hitherto recorded from Maine, yet all of them, judging from their previously known distribution, should have been expected to occur in the state. In their general distribution they may be classed as northern mosses reaching their southern limits in the bogs and swamps, usually if not always limy, of New England, New York, Pennsylvania, or Ohio, or in the general latitude of 40° N. Their names, together with the previously recorded distribution of each, are given below.

Hypnum stellatum Schreb. Eurasia. Greenland, Hudson Strait, Labrador, Newfoundland, Miquelon, Anticosti, Gaspé, Vermont, Massachusetts, Rhode Island, Pennsylvania, Ontario, Lake Superior, Manitoba, Montana, Athabasca, Canadian Rockies, British Columbia, Yukon, Alaska.

Hypnum scorpioides L. Eurasia. Greenland, Labrador, Newfoundland, Miquelon, Anticosti, Gaspé, New Hampshire, Vermont, Ontario, Peace River, Canadian Rockies, British Columbia, Yukon, Alaska.

Camptothecium nitens (Schreb.) Schimp. Eurasia. Hudson Strait, Labrador, Anticosti, Gaspé, New Brunswick, Vermont, Rhode Island, Connecticut, New York, Pennsylvania, Ontario, Minnesota, Saskatchewan, Peace River, Canadian Rockies, British Columbia, Northwest Territory, Alaska.

Hypnum trifarium Web. & Mohr. Eurasia. Greenland, Gaspé, Ontario, Ohio, British Columbia. No record of this species having been collected in New England has been found.

Even a casual perusal of the distribution of the last four species, as here outlined, will show the striking similarity of general range. The collections of the writer in the Gaspé Peninsula during the past four years have demonstrated the fact that there they, especially the last three, are occasionally associated in the marly bogs and along marly pond margins. The strikingly similar general range of the four in North America at least suggests the possibility that they may be closely associated elsewhere than in Gaspé and Maine. That the last named species has not been reported from as many stations as the other three may be due partly to the fact that it often grows more or less scattered or isolated through great colonies of much more conspicuous mosses, for example, *Hypnum scorpioides*.

PROVIDENCE, R. I.

VIOLA CHINENSIS IN THE EASTERN UNITED STATES.

EZRA BRAINERD.

THE behavior of *Viola chinensis* in four or five localities in the Eastern States indicates the possibility of its becoming established as a more or less troublesome weed. The story of the introduction of the gypsy moth and of the English sparrow into the United States, and of the American water-weed, *Elodea canadensis*, into the canals and rivers of England, should make us watchful of foreign plants or animals, that are cultivated from scientific curiosity.

I first made the acquaintance of *Viola chinensis* in the violet beds of the New York Botanical Garden. Numerous seedling plants were noticed, scattered about and growing with other species. In several instances it was the only plant that answered to a label such as *Viola hirta* (of Europe) or *V. odontophora* (of the Rocky Mts.). Evidently in these cases the plant originally set had died, and the self-sown *V. chinensis*, springing up in its place, had been taken by the gardener for the rightful plant. At the time I utterly failed to make out the proper name of the usurper; but plants and seeds were obtained for further study in my own garden.

I soon learned to connect this puzzle with another. In the Britton Manual, p. 637, there is described a stemless, purple violet, "escaped from cultivation and established, Washington, D. C. Adventive from Europe," under the name "*Viola lancifolia* Thore." But a moment's reference to a European Botany reveals the fact that Thore's *V. lancifolia* is a *stemmed* violet, allied to, if not a variety of, the Dog-violet (*V. canina*). Yet however unaccountable the use of this name might be, the plant so designated by Mr. Pollard was evidently identical with the lusty stranger at Bronx Park.

The plants transferred to the Middlebury garden seemed but little disturbed by the change, and kept on producing seeds until late in the autumn. The following spring numerous young plants came up within a radius of eight feet from the mother plants, so that I destroyed the fine crop that had appeared from seeds intentionally sown in the seed boxes,— realizing that my guest was making himself rather too much at home with me. A few weeks later I received living plants of the same thing from Prof. Fernald, of Cambridge, who spoke of it as a strange violet which "has become a weed in a large portion of the Botanic Garden."

On my next visit to Washington, last April, I was able through the kind assistance of Mr. Theo. Holm to clear up much of the mystery that had surrounded the plant. Specimens sent to Mr. W. Becker, the violet specialist of Berlin, were pronounced by him to be *Viola chinensis* G. Don, a native of Eastern Asia. Mr. Holm was informed at the Botanic Garden that the plants came from seed obtained in England about twenty years ago, and that it had spread as a weed in the garden. I saw it also well established in the grounds about Mr. Holm's residence in Brookland, D. C., to which he had transferred plants about ten years previous.

The plant though very distinct from any American species, is yet more nearly allied to our *V. sagittata* and *V. cucullata* than to any species of Europe or of Western America,— another instance of the close relationship, pointed out by Dr. Gray, between the Flora of northeastern Asia and that of northeastern America. *V. chinensis* has a long, stout, somewhat branching root, and seems well prepared to withstand drought, or the hot sun of open fields. The flower is lilac-purple; the spur 7 mm. long, rounded at the end, much compressed laterally, being 4 mm. wide but only 1.5 mm. thick. The numerous cleistogamous capsules are ovoid, green, on erect peduncles. Most of the stations named are populous cities of Japan or Eastern China; from which we may surmise that the species is more or less domesticated, and thrives in cultivated ground in the Orient, as it certainly does with us.

MIDDLEBURY, VERMONT.

SPHAGNUM FAXONII; AN ADDITION TO THE FLORA OF NEW ENGLAND.

CARL WARNSTORF.

SINCE my friend the late Edwin Faxon was one of the original members of the New England Botanical Club, it seems fitting that the Sphagnum which I have recently named in his memory should be brought to the attention of his old associates by publishing in RHODORA a translation of the original description.[1] I wish to say, by way of preface, that Mr. Faxon, an indomitable collector of Sphagna, sent me for investigation during the nineties thousands of specimens from New England, all prepared with the most pains-taking care. To many others than myself "Sphagna Boreali-Americana Exsiccata," an extremely noteworthy collection of one hundred seventy-two representative specimens of American peat mosses issued by Faxon in collaboration with Professor D. C. Eaton, stands as testimonial to his persevering and accurate work as a collector. Faxon was preëmi-

[1] Neue europäische und aussereuropäische Torfmoose. Hedwigia XLVII. p. 117 (1908).

nently lovable, unselfish, and modest,—such a man as I have but seldom come in contact with during my life. He translated my "Contributions to the Knowledge of the North American Sphagna" for publication in the Botanical Gazette,[1] but although I urged him to do so, he did not associate his own name with the articles. I hope that in describing the following moss I have permanently connected the name of this truly exceptional man with his favorite genus.

SPHAGNUM FAXONII Warnst. Forming closely compacted tufts as much as 12 cm. deep, below grayish-brown, above pale yellowish, in habit similar to a weak *Sph. cuspidatum* var. *plumosum*. Cortex of two or three layers of cells, plainly differentiated from the strong, pale or yellowish woody axis. Prosenchyma cells widened and thick-walled. Stem leaves (both dry and moist) spreading, isosceles-triangular or in part almost triangular-linguiform, 0.75–1.00 mm. long and 0.50–0.60 mm. broad, at the narrow truncate apex minutely denticulate, otherwise entire, with broad margins which are greatly expanded below the middle. Hyaline cells either not at all or only occasionally septate, fibrillose in the upper third or even to the middle of the leaf, on the inner surface mostly with a few unringed pores between the fibrils, on the outer surface, toward the apex, with a few small corner-pores. Fascicles moderately crowded, generally three- but occasionally four-branched. Branches almost equally strong and spreading, up to 12 mm. in length, attenuated toward the apex; their leaves crowded, when dry not or hardly at all undulate, when moist slightly turned to one side, lanceolate, on the average 1.40–1.45 mm. long and 0.30–0.35 mm. wide, at the broad truncate apex coarsely three- or four-toothed, narrowly margined by two or three rows of elongated cells, involute clear to the base so as to be almost tubular, entire. Hyaline cells reënforced by numerous fibril-bands, on the inner surface of the leaf with comparatively few generally unringed medium sized pores in the cell angles, on the outer surface with hardly any pores except in the lower cell angles, but occasionally weakly ringed pseudo-pores occur in short rows along the commissures of scattered cells. Chlorophyll cells in cross-section usually trapezoidal and exposed on both sides of the leaf, with the longer of the parallel sides exposed on the outer surface, but triangular cells occur sporadically, in which case they are enclosed on the inner surface of the leaf by the

[1] Bot. Gaz. XV pp. 127–140, 189–198, 217–227, 242–255. (1890.)

strongly under-arching hyaline cells.— Massachusetts, 16 Sept., 1891, leg. Faxon.

This species may be distinguished from *Sph. cuspidatum* by the very narrowly margined branch leaves, from *Sph. angustilimbatum* by much smaller stem leaves which are not fibrillose to the base, and which have the margins broadened below, as well as by the mostly three-branched fascicles with equally divergent branches.

FRIEDENAU, 25 Feb. 1908.

NOMENCLATORIAL CHANGES IN ISOËTES.— ISOËTES MACROSPORA Dur., var. **heterospora**, comb. nov. *Isoëtes heterospora* A. A. Eaton appears to be a form of *I. macrospora* Dur., endemic in streams and ponds on Mt. Desert Island. The vegetative parts of the two appear to be practically identical, differences being confined to the spores, which vary greatly in size and markings in the Mt. Desert plants. I therefore think it proper to reduce *I. heterospora* to the rank of a variety of *I. macrospora*.

I. DODGEI A. A. Eaton, var. **Robbinsii**, comb. nov. In compliance with Art. 49 of the Vienna Code the name *I. Dodgei* must be restored to the species designated by Engelmann as *I. riparia*, var. *canadensis* (*I. canadensis* A. A. Eaton), since it is the earliest name of the plant in its present rank. It becomes necessary, therefore, to change *I. canadensis*, var. *Robbinsii* to *I. Dodgei*, var. *Robbinsii*.— A. A. EATON, The Ames Botanical Laboratory, North Easton, Massachusetts.

A SOUTHERN FLORA AND FAUNA OF POST-PLEISTOCENE AGE IN ESSEX COUNTY, MASSACHUSETTS.

JOHN H. SEARS.

THIS paper is the result of special studies upon a fossil or ancient marine molluscan fauna, collected in estuaries and bays on our coast, with a view to explaining the presence of certain plants of a southern flora found growing today in Essex County, Massachusetts, and elsewhere near the coast of New England. The data and conclusions of the paper may be stated under three headings.

I. A warm epoch is indicated by the presence in Essex County and in adjacent parts of New England of a southern flora which has become acclimated here and is apparently a survival from a warmer period. The most striking plants of this flora are enumerated below, and for sake of clearness the distance in miles from their stations north of Boston to the nearest known stations south of Boston is given.

Names of Plants.	*Stations north of Boston.*	*Interval in Miles*[1]	*Nearest known Stations south of Boston.*
Sparganium lucidum Fernald & Eames.	Medford.	65	Barnstable, Mass.
Sagittaria Engelmanniana J. G. Smith.	Tewksbury.	80	Barnstable, Mass.
Echinodorus tenellus (Martius) Buchenau.	Winchester.	340	Canterbury, Del.
Scirpus Hallii Gray	Winchester.	1115	Indian River, Fla.
Fuirena squarrosa Michx.	Tewksbury.	50	Plymouth, Mass.
Scleria reticularis Michx.	Winchester.	40	Plymouth, Mass.
Betula nigra L.	Merrimac Valley, Pelham, N.H.; Lawrence; North Andover; Ipswich (rare).	115	Suffolk Co., L. I.
Magnolia virginiana L.	Essex and Magnolia Swamps, becoming nearly extinct.	120	Suffolk Co., L. I.
Crotalaria sagittalis L.	Cambridge, Winchester, Wakefield, etc.	40	Plymouth, Mass.
Linum sulcatum Riddell.	Peabody and Arlington.	40	Providence, R. I.
Ilex opaca Ait.	Rockport, where extinct since 1880.	36	Quincy, Mass.
Ilex glabra (L.) Gray.	Wenham and Magnolia Swamps, where the growing shrubs are rarely more than 2 feet high with stems ½ inch in diameter.	30	Blue Hill Reservation, Mass.
Ludwigia sphaerocarpa Ell.	Waltham, Bedford, Lowell, etc.	105	Guilford, Conn. & Suffolk Co., L. I.
Sabatia stellaris Pursh.	Amesbury and Salisbury.	50	Pembroke, Mass.
Cuscuta arvensis Beyrich.	Winchester.	90	Nantucket.
Cuscuta compacta Juss.	Tewksbury.	50	Lincoln, R. I.
Coreopsis rosea Nutt.	Winchester and Woburn.	40	Plymouth, Mass.

Professor W. G. Farlow, in the Marine Algae of New England, p. 6, writes "In the town (now city) of Gloucester, near the village of Squam, is a small sheet of water called Goose Cove. In this cove, to my surprise, I found *Rhabdonia tenera, Gracilaria multipartita, Chondria Baileyana, Polysiphonia Harveyi,* and *Polysiphonia Olneyi.* In short the flora was entirely different from anything I had ever seen before north of Cape Cod."

II. A warmer period is indicated in Essex County, Massachusetts, and in other parts of New England, by the finding on our coast of a fossil marine fauna such as is now known to inhabit the mud on the coast primarily south of Cape Cod, where the waters of the bays are much warmer than on the coast of Essex County. In deep digging for the foundation of the Boston and Maine Railroad bridge across Parker River in Newbury, the workmen came upon a large bed of

[1] These distances are in a direct line taken from Colton's Atlas.

shells of the oyster, *Ostrea virginiana*, many of which had both valves intact, showing that they had lived in the mud there. A few years later, in putting a new foundation for the railroad bridge at Rowley across Rowley River, still larger beds of shells of *Ostrea virginiana* were uncovered, some of which shells were 12 inches long by 3 inches wide. Upon an examination along the shore, I found extensive Indian shell heaps made nearly exclusively of these shells. Again, upon the working over of another Indian shell heap, on Perkins Island, Ipswich River, there were found large deposits of these shells, together with shells of *Venus mercenaria* (Quahog) and *Mya arenaria* (the common clam).

Recent investigations, in looking over the mud dredged from the bed of Bass River in Beverly, revealed shells of *Ostrea virginiana*, together with shells of *Pecten gibbus* L. var. *borealis*, *Astarte sulcata* and *A. undata* Gould, and *Pandora Gouldiana* Dall; also a coralline cluster of Bryozoans incrusting stones (*Schizoporella unicornia* Johnston, identified by Dr. Bassler of the National Museum). These cluster-colonies completely covered stones six inches long and three inches broad and were built up nearly half an inch thick. In washing the mud I collected many thousands of shells of Foraminifera of several species.

A few feet below the living fauna, in the muddy bottom of Danvers River, near the new bridge connecting North Salem with Beverly, I found another large bed of the shells of *Ostrea virginiana*, together with numerous shells of *Pecten*. Shells of *Astarte undata* were also abundant; and shells of *Anomia glabra* Verrill, of great size, one of them three inches in diameter, with many other species, were thickly scattered among them. Shells of *Venus mercenaria* (Quahog), some of which measured four and a half by three and a half inches, were common. Several species of coralline clusters of Bryozoans, including *Schizoporella* sp. and *Escharella variabilis* Verrill, were found.

The fauna represented by the above species, from these various stations in Essex County, is now known to live south of Cape Cod, where the Gulf Stream flows nearer the coast thus giving a much warmer climate. This indicates that there must have been a similar warm climate on the coast of Essex County, when this fauna flourished here and elsewhere north of Cape Cod — on the coast of northern New England and probably in the Bay of Fundy and the Gulf of St. Lawrence; and as these shell fish, *Ostrea virginiana*, *Venus mercenaria*,

etc., were used by the Indians as food, they must have lived here in our tidal estuaries and harbors until modern times.

III. The warm epoch along the coast of Essex County and northern New England is explained by an elevation of the land in New England and adjacent regions which followed the Champlain subsidence. At the end of the Champlain subsidence the land on our coast had become submerged to a depth of 360 or more feet, as pointed out in the Physical Geography and Geology of Essex County.[1] After the Champlain subsidence the land was again elevated, as is proved by the finding of fossil shells of *Portlandia arctica* Gray, *P. lucida* Loven, and other species of Arctic mollusks, together with the hard parts of a large starfish, *Asteracanthion Lincki* Muhler, in the clay beds at about the present sea level in Danvers and Lynn, Essex County, Massachusetts; for at present the above species of *Portlandia* are taken alive on the coast of Norway only at a depth of from 360 to 500 feet. Judging from the rate of the subsidence now going on,[2] about one foot in a century, this elevation of 360 or more feet must have taken approximately 36,000 years. In the course of this elevation at the North, the Straits of Belle Isle must have become land locked,[3] thus forcing the Labrador current, with its cold waters and icebergs, to join the Greenland current in its northward flow. This closing of the Straits of Belle Isle allowed the warm waters of the southern seas to come into Cape Cod and Boston Bays. Under such conditions the climate of Essex County and northern New England must have been similar to the climate of southern New England, and probably to that of the New Jersey coast; and a warm epoch continued here probably for a long time. During this epoch the fauna previously described, of *Ostrea*, *Pecten*, etc., was introduced and multiplied in our waters; and as the land emerged above the waters the southern flora took possession of it. Some of the plants of that southern flora, as previously noted, have survived to the present time, according to situation or environment, and have become acclimated.

Professor James D. Dana writes "On the coast of Maine there are large Indian shell heaps of the common clam, *Venus mercenaria* (the Quahog of the Indians) and, in some places, of the Virginia Oyster, species that are now nearly extinct on the cold coast. As made known by Verrill there is a colony of living southern species in Quahog Bay,

[1] Sears, Phys. Geogr., Geol. etc. of Essex Co. 373. (1905).
[2] See Sears, l. c.; Chapter on Subsidence, p. 58.
[3] At the present time an elevation of 200 feet would close the Straits of Belle Isle.

near Bath, twenty miles east of Portland, among which are *Venus mercenaria*, and others, reminding one, as Verrill says, of the coast fauna of New Haven, on Long Island Sound. Shells of oysters, clams, and scallops (the southern *Pecten irradiens*) are abundant in the deeper portions of the mud of the harbor of Portland. As with the flora, so with the fauna, certain species are found to-day, living in protected situations." [1]

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NOTES ON SOME PLANTS OF NORTHEASTERN AMERICA.

M. L. FERNALD.

DURING studies upon various North American plants the attention of the writer has been called to several northeastern species, varieties, and notable forms which are either undescribed or are now passing by names which they cannot retain under the international rules adopted at Vienna. Most of these plants are of such diverse affinities as to furnish slight thread for a continuous discussion, and the notes upon them have, therefore, been allowed to accumulate. As the number of these notes is now considerable they are here presented that they may be more readily available.

POTAMAGETON **bupleuroides,** n. sp., caulibus gracilibus 1–2 mm. crassis 3–7 dm. longis plerumque ramosissimis rectis, internodiis brevibus 0.5–1.5 (raro ad 3) dm. longis; foliis planis fulvis valde unicostatis nerviis lateralibus 6–16, superioribus orbicularibus vel ovatis obtusis basi amplexicaulibus 1–3 cm. longis, inferioribus ovatis vel lanceolatis obtusis vel subacutis 2.5–4.5 cm. longis; stipulis obsoletis vel nullis; pedunculis gracilibus 2–6 cm. longis; spicis 0.7–2 cm. longis; fructibus anguste obovoideis 2.5–3.2 mm. longis lateraliter compressis valde impressis dorso convexo obscure carinato, stylo gracili, epicarpo olivaceo-fulvo arcte contento. —Stems slender, 1–2 mm. thick, not spongy, 3–7 dm. long, simple below, usually much branched above,

[1] Dana Manual of Geology, 561.

straightish; the internodes short, 0.5–1.5 (rarely becoming 3) dm. long: leaves flat, scarcely crisped at the margin, drying bronze or blackish-green, 7–17-nerved, only the midrib prominent; the upper orbicular to ovate, obtuse, amplexicaul, 1–3 cm. long; the lower ovate to lanceolate, obtuse or subacute, 2.5–4.5 cm. long: stipules obsolete or when present very short and inconspicuous: peduncles slender, not spongy-thickened, 2–6 cm. long: spikes 0.7–2 cm. long: fruit slender-obovoid, 2.5–3.2 mm. long, the sides flat and deeply pitted, the back rounded and obscurely 3-keeled; style slender and prominent; epicarp olive- or reddish-brown, closely investing the seed.— Brackish, occasionally fresh, ponds and quiet streams, Newfoundland and Gaspé Co., Quebec to Florida, chiefly near the coast, and rarely inland to western New York and Michigan. Type collected in pools at Holyrood, NEWFOUNDLAND, 23 August, 1894 (*Robinson & Schrenk*, no. 207). The coastal representative of *Potamogeton perfoliatus*, which has ordinarily thicker softer or spongy stems and peduncles; larger crisp-margined greener leaves with more numerous nerves (15–27); stipules, when developed, nearly 1 cm. long; longer spikes; and larger fruit which is more obviously keeled and has a looser-fitting or puckered epicarp.

MELICA STRIATA (Michx.) Hitchc., forma **albicans** (Fernald), n. comb. *Avena striata* Michx., forma *albicans* Fernald, RHODORA, vii. 244 (1905).

ERIOPHORUM TENELLUM Nutt., var. **monticola**, n. var., nanum 1–2 dm. altum; foliis confertis; spicis solitariis; bractea involucris et squamis ut apud formam typicam.— Dwarf, 1–2 dm. high, with crowded leaves: spike solitary: involucral bract and scales as in the typical form.— QUEBEC, in a quagmire at the edge of Lac Chicoutey, altitude 975 m., Table-top Mountain, Gaspé Co., August 10, 1906 (*Fernald & Collins*, no. 174). A very pretty alpine extreme of the common *E. tenellum* (*E. paucinervium* A. A. Eaton), in its solitary spike suggesting *E. Chamissonis*, var. *albidum*; but with the definite 1-leaved involucre, the elongate acute leaf-blades, and the pale stramineous scales of *E. tenellum*.

CAREX SCIRPOIDES Schkuhr, var. **capillacea** (Bailey), n. comb. *C. interior* Bailey, var. *capillacea* Bailey, Bull. Torr. Bot. Cl. xx. 426 (1893).— In the Proceedings of the American Academy, xxxvii. 457, 485 (1902) and in other publications the writer has inclined to the opinion that Schkuhr's *C. scirpoides* (1806) could not be maintained

on account of the earlier *C. scirpoidea* Michx. (1803) and that the species described by Schkuhr must be known as *C. interior* Bailey. The Vienna Code, however, indicates that, although differing only slightly, the names are to be treated as different.

CAREX SCIRPOIDES Schkuhr, var. **Josselynii** (Fernald), n. comb. *C. interior* Bailey, var. *Josselynii* Fernald, RHODORA, viii. 115 (1906).

CAREX DIANDRA Schrank, var. **ramosa** (Boott), n. comb. *C. teretiuscula* Good., var. *ramosa* Boott, Ill. 145 (1867). *C. prairea* Dewey in Wood, Classbook, 578 (1855). *C. teretiuscula*, var. *prairea* Britton in Britton & Brown, Ill. Fl. i. 344 (1896).— The name *C. diandra* Schrank, Cent. Bot. Anmerk. 57 [49] (1781) must replace the later *C. teretiuscula* Good. Trans. Linn. Soc. ii. 163 (1794).

CAREX ROSTRATA × SAXATILIS, var. MILIARIS, n. hybr., quam *C. saxatilis*, var. *miliaris* (Michx.) Bailey vix minus gracilis; culmis 2.5–4 dm. altis supra scabris; foliis planis elongatis 2–3 mm. latis; spicis fertilibus 1–5 varie dispositis nunc omnibus vel fere omnibus arcte aggregatis nunc remotis 1–3 cm. longis; perigyniis stramineis ovoideis obscure nerviis vel enerviis, rostro brevi acuto bidentato; squamis purpureis in eodem specimine longitudine diversis obtusis vel acuminatis; acheniis plerumque abortivis.— Nearly as slender as *C. saxatilis* L., var. *miliaris* (Michx.) Bailey, the culms, 2.5–4 dm. high, scabrous above: leaves flat, elongate, 2–3 mm. broad: pistillate spikes 1–5, variously disposed, sometimes all or nearly all closely aggregated, sometimes all or nearly all very remote, 1–3 cm. long: perigynia stramineous, ovoid, faintly nerved or nerveless; the short beak sharply bidentate: scales purplish, of various lengths on the same plant, blunt or acuminate: achenes mostly undeveloped.— QUEBEC, growing with the two parents in a boggy meadow near the northern end of Table-top Mountain, Gaspé Co., August 13, 1906 (*Fernald & Collins*, no. 188).

JUNCUS ALPINUS Vill., var. **fuscescens**, n. var., ramis inflorescentiae laxe ascendentis non strictis, glomerulis compactis regulariter floriferis, floribus viridescentibus vel stramineis.— Branches of the inflorescence loosely ascending, not strict: glomerules compact and regularly flowered: flowers greenish or straw-colored.— Widely distributed from western Vermont to British Columbia and Missouri. Type collected about a brackish spring, Cayuga Marshes, NEW YORK, August 16 and September 23, 1885 (*W. R. Dudley*, no. 137). In *J. alpinus* and its var. *insignis* Fries, the branches of the inflorescence

are strict, and the loose glomerules usually have one or more of the flowers elevated above the rest on elongate pedicels.

QUERCUS RUBRA L., var. **ambigua** (Michx. f.), n. comb. *Q. ambigua* Michx. f., Hist. Arb. Am. ii. 120, t. 24 (1812). *Q. borealis* Michx. f., N. Am. Sylva, i. 198 (1859). *Q. coccinea*, var. *ambigua* Gray, Man. ed. 5, 454 (1867).— This tree not only in its foliage but in its generally northern or upland range is clearly an extreme of *Q. rubra*, rather than of the ordinarily more southern *Q. coccinea*.

NYMPHAEA ADVENA Ait., var. **variegata** (Engelm.), n. comb. *Nuphar advena* Ait. f., var. *variegatum* Engelm. in Gray, Man. ed. 5, 57 (1867). *Nymphaea variegata* G. S. Miller, Proc. Biol. Soc. Wash. XV. 13, pl. 2 (1902).— Both the yellow Cow Lilies and the White (or pink) Pond Lilies were included by Linnaeus under *Nymphaea*, but by the majority of authors this name has been subsequently maintained for the genus including our familiar fragrant White Water Lily, while the yellow Cow Lilies have taken the name *Nuphar* Sibth. & Smith (1808 or 1809). Prior to the splitting of the Linnean genus by Sibthorp & Smith, however, Salisbury had published an elaborate monograph of the showier Water Lilies as *Castalia* (1805), leaving the name *Nymphaea* to stand for the remainder of the Linnean genus, *i. e.* the plants which were later taken up under the name *Nuphar*. It is unfortunate that such confusion in the names has prevailed, but the principle of priority demands the taking up of *Castalia* and of *Nymphaea* (*Nuphar*).

CASTALIA ODORATA (Ait.) Woodville & Wood, var. **gigantea** (Tricker), n. comb. *Nymphaea odorata* Ait., var. *gigantea* Tricker, Water Garden (1897) ex Conard, Water Lilies, 186.

THALICTRUM POLYGAMUM Muhl., var. **hebecarpum**, n. var., carpellis villosis; foliolis subtus plerumque pubescentibus.— Carpels villous: lower surfaces of the leaflets usually pubescent.— The northeastern extreme of the species, more abundant than the typical form of the species in the Gaspé Peninsula and northern Maine, extending to Newfoundland, New Hampshire, and southern Ontario. Type collected in a gravelly thicket by the St. Lawrence, Rivière du Loup, QUEBEC, August 2, 1902 (*E. F. Williams & M. L. Fernald*).

FRAGARIA **multicipita**, n. sp., caespitosa; caudice rarissime stolonifero in ramos (apud exempla robusta etiam 30–40) breves congestos diviso; ramis quibusque folia 3–4 gerentibus; petiolis 2–7 cm. longis gracillimis appresse sericeis; foliolis 1–2.5 cm. longis supra viridibus

paulo strigosis vel glabratis subtus albis paulo appresse sericeis, terminali anguste cuneato-obovato vix stipellato infra apicem rotundatum vel subtruncatum grosse incurvo-serratum integro, lateralibus obliquis latere interiori cuneata basi integro latere exteriori basi rotundato dentato; scapis gracillimis sericeis quam petioli brevioribus vel eos subaequantibus 1–2 (raro 4)-floris; bracteis lanceolatis integris vel laceratis; pedicellis fructiferis recurvatis; calyce 5–10 mm. lato, lobis lanceolato-oblongis acuminatis; bracteolis paulo angustioribus; fructu ut apud *F. virginianam* subgloboso vel breviter ovoideo 5–10 mm. longo; achaeniis laevibus 1 mm. longis.— Plant caespitose, the caudex freely divided into several (in large plants 30 to 40) short crowded upright branches, very rarely stoloniferous; each branch bearing 3 or 4 small leaves: petioles 2–7 cm. long, very slender, appressed-silky: leaflets 1–2.5 cm. long, green and slightly strigose or glabrate above, white and sparingly appressed-silky beneath; the terminal narrowly cuneate-obovate, barely stipellate, entire below the rounded or subtruncate coarsely incurved-serrate tip; lateral leaflets oblique, the inner side cuneate and entire at base, the outer rounded at base and toothed: scapes very slender, silky, shorter than or about equaling the petioles, 1–2 (rarely 4)-flowered: bracts lanceolate, entire or lacerate: fruiting pedicels recurving: calyx 5–10 mm. broad, the lobes lance-oblong, acuminate; bractlets slightly narrower: fruit as in *F. virginiana*, subglobose or short-ovoid, 5–10 mm. long: achenes smooth, 1 mm. long.— Quebec, gravelly and sandy beaches and bars or the River Ste. Anne des Monts, July 14–17, 1906 (*Fernald & Collins*, no. 230).

Potentilla monspeliensis L., var. **labradorica** (Lehm.), n. comb. *P. labradorica* Lehm., Del. Sem. Hort. Hamb. 12 (1849) and Pugil. ix. 21 (1851).— This little known plant has been collected recently at several stations, not only on the Labrador coast, but about the lower St. Lawrence and on the White Mountains. It is a pronounced extreme of the common bristly-villous *P. monspeliensis*, in which the pubescence is nearly or quite wanting. The specimens examined are all small, some tufted and acaulescent, others simple and becoming 3 dm. high.

Rubus idaeus L., var. aculeatissimus Regel & Tiling, forma **albus**, n. comb. *R. strigosus* Michx., var. *albus* Fuller ex Bailey, Cyc. Am. Hort. 1582 (1902).

Rubus allegheniensis Porter, forma **albinus** (Bailey), n. comb.

R. villosus, var. *albinus* Bailey, Am. Gard. xi. 720 (1890). *R. nigrobaccus* Bailey, var. *albinus* Bailey, Evolution of Our Native Fruits, 380 (1898).— As recently shown by Mr. W. H. Blanchard (RHODORA, viii. 217) *R. allegheniensis* Porter (1896) must be taken up in place of *R. nigrobaccus* Bailey (1898).

RUBUS ALLEGHENIENSIS Porter, var. **calycosus** (Fernald), n. comb. *R. nigrobaccus*, var. *calycosus* Fernald, RHODORA, iii. 234 (1901).

RUBUS ALLEGHENIENSIS Porter, var. **Gravesii** (Fernald), n. comb. *R. nigrobaccus*, var. *Gravesii* Fernald, RHODORA, iii. 295 (1901).

ASTRAGALUS ALPINUS L., var. **Brunetianus**, n. var., ramis elongatis 2–6 dm. longis; foliolis plerumque 15–29; leguminibus maturis virescentibus vel stramineis strigosis, pilis brevis nigris vel albidis.— Branches elongate (2–6 dm. long): leaflets usually 15–29: mature pods greenish or pale brown, strigose with short black or even whitish hairs.— Calcareous ledges and gravelly shores, eastern Quebec to Hudson Bay, south to southern New Brunswick, central Maine, and Vermont; also abundant in the Rocky Mts. Type collected on gravelly shores, Fort Fairfield, MAINE, July 18, 1893 (*Fernald*, no. 24). Dedicated to the late Abbé Louis Ovide Brunet, of Laval University, Quebec, a close student of the flora of Quebec and founder of the botanical Museum of his university. The more northern or alpine *Astragalus alpinus* is a smaller plant with fewer leaflets (11–23) and with the pods intensely black with long slightly spreading hairs. The two extremes clearly pass together as shown by several specimens, and the more southern plant has been called by Mr. E. P. Sheldon *Astragalus giganteus* (Pallas) Sheldon (Bull. Geol. and Nat. Hist. Surv. Minn. ix. 65). Pallas's *A. alpinus*, var. *giganteus*, however, upon which Mr. Sheldon based his so-called species, is shown clearly by the original plate (Astrag. 42, t. 33) to have little to do with our plant, but to be nearer related to *A. oroboides*.

LESPEDEZA CAPITATA Michx., var. **velutina** (Bicknell), n. comb. *L. velutina* Bicknell, Torreya, i. 102 (1901). *L. Bicknellii* House, Torreya, v. 167 (1905).— Prolonged study in the field has convinced the writer that, although *L. velutina* is a notable extreme of the very variable *L. capitata*, it does not retain its characters with sufficient constancy to merit specific rank.

CALLITRICHE **anceps**, n. sp., caulibus valde compressis ancipitis humilibus simplicibus vel subsimplicibus 5–25 mm. longis, internodiis perbrevibus 1–4 mm. longis; foliis uniformibus linearibus 2–7 mm.

longis, apice leviter emarginato; fructu suborbiculari 0.5–0.8 mm. diametro angulis rotundatis, stigmatibus celeriter deciduis.— Stems strongly compressed, ancipital, low, simple or subsimple, 5–25 mm. long; the internodes very short, 1–4 mm. long: leaves uniform, linear, 2–7 mm. long, slightly emarginate at apex: fruit suborbicular, 0.5–0.8 mm. in diameter, the angles rounded; stigmas promptly deciduous, not observed in any of the mature specimens.— In silt and granitic gravel at the bottoms of alpine and subalpine ponds and lakes, Table-top Mountain, Gaspé Co., QUEBEC. Type collected in "Lac des Américains," altitude 670 m., western base of Table-top Mt., August 1, 1906 (*Fernald & Collins*, no. 234). Observed in many other lakes and ponds up to an altitude of 1150 meters. Ordinarily the plant, which is quickly distinguished from *C. heterophylla* by its small size, uniform foliage, ancipital stem, and promptly deciduous stigmas, grows in deep water with *Subularia aquatica*, *Isoëtes macrospora*, etc., and shows no inclination to lengthen its stem and to reach the surface. Occasionally it is stranded at the margins of lakes when it becomes very dwarf, with closely crowded shorter uniformly linear-oblanceolate leaves.

RHUS CANADENSIS Marsh., var. **illinoensis** (Greene), n. comb. *Schmaltzia illinoensis* Greene, Leafl., i. 131 (1905).— A shrub of central Illinois differing from the typical form of the species in its greater pubescence.

SPHAERALCEA **remota** (Greene), n. comb. *Iliamna remota* Greene, Leafl., i. 206 (1906). *Sphaeralcea acerifolia* Gray, Syn. Fl. i. 317, as to Illinois plant, not Nutt. in Torr. & Gray, Fl., i. 228.— Professor Greene has shown very clearly that the local plant of a gravelly island in the Kankakee River, near Altorf, Illinois, is specifically distinct from the northwestern plant described by Nuttall as *S. acerifolia*.

MYRIOPHYLLUM HUMILE (Raf.) Morong, forma **natans** (DC.), n. comb. *M. ambiguum* Nutt. Gen. ii. 212 (1818). *M. ambiguum*, var. *natans* DC. Prodr. iii. 70 (1828).— Rafinesque's *Burshia humilis* (1808) was clearly the dwarf shore plant which has been known as *Myriophyllum ambiguum*, var. *limosum* Nutt., and, as the first specific name, must be retained for the species.

MYRIOPHYLLUM HUMILE, forma **capillaceum** (Torr.), n. comb. *M. capillaceum* Torr. Compend. 355 (1826). *M. ambiguum*, var. *capillaceum* Torr. & Gray, Fl. i. 530 (1840).

OSMORHIZA LONGISTYLIS (Torr.) DC., var. **villicaulis**, n. var.,

caulibus albo-villosis, foliis fructibusque eis formae typicae similibus. — Stems white-villous: leaves and fruit as in the typical form.— Pennsylvania, Illinois and Kansas; the type collected on limestone, on the Conostega, near Binkley's Bridge, Lancaster Co., PENNSYLVANIA, June 21, 1901 (*A. A. Heller*). In its pubescence strongly simulating *O. Claytoni* (Michx.) Clarke, but with the foliage and fruit of *O. longistylis*.

LYONIA **nitida** (Bartr.), n. comb. *Andromeda nitida* Bartr. ex Marsh. Arb. 8 (1785). *Pieris nitida* Benth. & Hook. f. Gen. ii. 588 (1876).— *Lyonia* is well distinguished from *Andromeda* by its angulate capsule with thickened or corky sutures, and by its awnless anthers.

LYONIA LIGUSTRINA (L.) DC., var. **foliosiflora** (Michx.), n. comb. *Andromeda pedunculata*, var. *foliosiflora* Michx. Fl. i. 254 (1803). *Xolisma foliosiflora* Small, Fl. 889, 1336 (1903).— This variety is more pronounced in the Southern States than in the North, where the typical form of the species is most abundant. Occasionally, however, the variety is found in New England.

GAYLUSSACIA BACCATA Wang., forma **leucocarpa** (Porter), n. comb. *G. resinosa* (Ait.) Torr. & Gray, var. *leucocarpa* Porter, Bull. Torr. Bot. Cl. xvi. 21 (1889).— Mr. Mackenzie has recently called attention[1] to the fact that Wangenheim, in 1787, clearly described and illustrated our common Huckleberry as *G. baccata*, two years before the shrub was designated by Aiton *Vaccinium resinosum*. The white- or amber-fruited form is rare, but it is occasionally found in sufficient quantity to furnish fruit to local markets.

VACCINIUM **neglectum** (Small), n. comb. *Polycodium neglectum* Small, Fl. 893, 1336 (1903).— A pretty species of our southeastern states with the branchlets, leaves, etc., strictly glabrous.

VACCINIUM **nubigenum**, n. sp., caule fruticoso 2–7 dm. alto, ramis teretibus purpureo-brunneis junioribus pubescentibus vel glabrescentibus; foliis ellipticis utrinque subacutis 1.5–3.5 cm. longis 7–17 mm. latis submembranaceis glabris sublucidis valde reticulatis serrulatis, dentibus spinulosis; floribus axillaribus solitariis, pedunculis 3–5 mm. longis; corollis ellipsoideo-urceolatis 6 mm. longis 4–5 mm. latis; baccis globosis vel pyriformibus glauco-nigris 7–9 mm. longis.— Shrub 2–7 dm. high: branches terete, the older ones purplish-brown beneath the freely exfoliating light gray epidermis; the young branchlets paler brown, puberulent or glabrate: leaves elliptic, subacute at each end,

[1] K. K. Mackenzie, Torreya, vii. 60 (1907).

1.5–3.5 cm. long, 7–17 mm. wide, submembranaceous, glabrous, somewhat lustrous, the veins prominently reticulate, the fine and numerous appressed teeth spinulose: flowers axillary, solitary, on peduncles 3–5 mm. long: corolla ellipsoid-urceolate, pink, 6 mm. long, 4–5 mm. wide: berries globular or pyriform, deep blue-black, with a bloom, 7–9 mm. long.— Quebec, abundant in Gaspé County, in subalpine and alpine districts on the hornblende-schist of Mt. Albert, and on the granitic area of Table-top Mt. Type material, in flower and young fruit, collected on hornblende-schist or in the alluvium of an alpine brook, Allen's Ravine, north slope of Mt. Albert, July 26 and 28, 1906 (*Fernald & Collins*, no. 242); in mature fruit, on Table-top Mt., August 9, 1906 (no. 688). Also represented in the Gray Herbarium by nos. 684, 685, 687, 689, and 690. Associated in the subalpine forests and ravines with *V. ovalifolium* Sm. and *V. caespitosum* Michx., ordinarily in more sheltered situations than *V. uliginosum* L. and *V. pennsylvanicum*, var. *angustifolium* (Ait.) Gray. Nearest related to the northwestern *V. membranaceum* Dougl., which has the paler branches somewhat angled, the larger leaves paler beneath, and the larger corolla depressed-globose.

Centaurium **spicatum** (L.), n. comb. *Gentiana spicata* L. Sp. 230 (1753). *Erythraea spicata* Pers. Syn. i. 283 (1805).— The little group of plants known as Centauries were very generally called by pre-Linnean botanists *Centaurium*, but in the 1st edition of the *Species Plantarum* Linnaeus placed them under *Gentiana*. In 1790, Necker separated them as *Erithrea* (often spelled *Erythraea*) and they have subsequently borne that name. Prior to Necker's publication, however, as recently pointed out by Messrs. Britten & Rendle, the old name *Centaurium* had been clearly used by Hill in his British Herbal (1756), and consequently this historic name must be maintained for the genus. In eastern America we have two other species:

Centaurium **texense** (Griseb.), n. comb. *Erythraea texensis* Griseb. ex Hook. Fl. Bor.-Am. ii. 58 (1838) and Gen. et Sp. Gent. 39 (1839).

Centaurium **calycosum** (Buckl.), n. comb. *Erythraea calycosa* Buckl. Proc. Acad. Phila., 1862, 7 (1863).

Nymphoides **lacunosum** (Vent.), n. comb. *Villarsia lacunosa* Vent. Choix des Pl. 9 (1803). *Limnanthemum lacunosum* Griseb. Gen. et Sp. Gent. 347 (1839).— Hill, again, in 1756 clearly defined the European yellow-flowered Floating Heart as *Nymphoides*, fourteen years

before it was distinguished by S. P. Gmelin as *Limnanthemum* (1770), and this name must accordingly be used for our Floating Hearts. The larger of our northeastern species should be called

NYMPHOIDES **aquaticum** (Walt.), n. comb. *Anonymos aquatica* Walt. Fl. Carol. 109 (1788). *Limnanthemum trachyspermum* Gray, Man. ed. 5, 390 (1867). *Limnanthemum aquaticum* Britton, Trans. N. Y. Acad. Sci. ix. 12 (1889).

APOCYNUM CANNABINUM L., var. **nemorale** (G. S. Miller), n. comb. *A. nemorale* G. S. Miller, Proc. Biol. Soc. Wash. xiii. 87 (1899).— With the small greenish or greenish-white flowers of *A. cannabinum*, but with the leaves mostly drooping or spreading on elongate petioles 1–1.5 cm. long.

CONVOLVULUS SEPIUM L., var. **pubescens** (Gray), n. comb. *C. repens* L. Sp. 158 (1753) as to Gronovian plant. *C. sepium*, var. *repens* Gray, Syn. Fl. ii. pt. 1. 215 (1878). *Calystegia sepium* (L.) R. Br., var. *pubescens* Gray, Man., ed. 5, 376 (1867).— This pretty plant, abundant on the coast from the Gulf of St. Lawrence southward, is commonly pubescent, but not infrequently essentially glabrous, when it is separable from true *C. sepium* only by the less hastate basal lobes of the leaves, a character too inconstant to allow the specific separation of the two plants.

MYOSOTIS VIRGINICA (L.) B S P., var. **macrosperma** (Engelm), n. comb. *M. macrosperma* Engelm., Am. Jour. Sci., xlvi. 98 (1844). *M. verna* Nutt., var. *macrosperma* Chapm. Fl. 333 (1860).

GRAY HERBARIUM.

(*To be continued.*)

THE 13TH ANNUAL WINTER MEETING OF THE VERMONT BOTANICAL CLUB was held at the University of Vermont, Burlington, January 17 and 18. Nineteen new members were elected and the longest program in the history of the Club, with 23 titles, was carried out. The annual supper complimentary to visiting members was held on the evening of the 17th, followed by a very interesting lecture on "The Flora of the Shickshock Mts. and the Gaspé Coast" by Prof. M. L. Fernald of Harvard University, illustrated by lantern slides. John Ritchie Jr. gave a talk on Mt. Washington, where the Club intends to go the first week of July next. This was also illustrated by the lantern. The

officers were reelected as follows:— Pres., Ezra Brainerd, Vice-Pres., C. G. Pringle, Treas., Mrs. Nellie F. Flynn, Sec'y., L. R. Jones. Additional members of the executive committee, Dana S. Carpenter, Mrs. E. B. Davenport, Miss Nancy Darling. Miss May O. Boynton gave a report on a beginning of a Club Library and was appointed Librarian with authority to continue the work. The Club's Bulletin No. 3 will be issued some time in April probably.— NELLIE F. FLYNN.

SPARGANIUM DIVERSIFOLIUM, VAR. ACAULE IN MASSACHUSETTS.— In a preliminary list of New England *Sparganiaceae* (RHODORA, IX. 86, May, 1907) *Sparganium diversifolium* Graebner, var. *acaule* (Beeby) Fernald & Eames was reported from all the New England states except Massachusetts and Rhode Island. Late last summer I found this Sparganium in Framingham, Mass. There were several plants in a muddy brook in a warm, open meadow and they were fruiting well. Near by in a shallow pool drained by this stream were numerous plants of the species. None of the latter, however, were found in the running water, nor any of the variety in the pool and no intermediate forms were observed. With the list the suggestion was made that this plant be sought in central and western Massachusetts and in northwestern Rhode Island. It now seems that, as this dwarf variety has been found somewhat east of the hill country and in the midst of sand-plains, it may well be watched for elsewhere in eastern Massachusetts and perhaps through Rhode Island.— ARTHUR J. EAMES.

SALIX INCANA AT CASTINE, MAINE.— On Sept. 19, 1906, I collected in Castine, Hancock Co., Maine, a willow, which is pronounced by Prof. Fernald to whom it has been submitted for identification, *Salix incana* Schrank, a European species that, according to the Cyclopedia of American Horticulture, is cultivated by American Nurserymen.

The several plants found were growing on a dry natural bank or low bluff close by the sea beach. They were spreading and procumbent at their bases with branches rising to 4.5–6 dm.; leaves linear or narrowly lanceolate, with margins strongly revolute, and under surface densely white-tomentose.— ROBERT A. WARE, Boston.

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OEDOGONIUM HUNTII REDISCOVERED?

F. S. Collins.

In the American Naturalist, Vol. 1, p. 517, 1868, is an article entitled "A botanical excursion in my office" in which Horatio C. Wood describes in a popular way a number of minute plants appearing in an aquarium. Figures of some of them are given, 3, 4, 5 & 7 representing an *Oedogonium*, no species being indicated by name. In A Prodromus of a Study of the Fresh water Algae of North Eastern North America, Proc. Amer. Phil. Soc., Vol. X, p. 333, 1869, the same writer proposes the name of *Oedogonium Huntii* for the plant. This Prodromus was followed by the more elaborate A Contribution to the History of the Fresh-Water Algae of North America,[1] Smithsonian Contributions to Knowledge, Vol. XIX, 1874. In this the genus *Oedogonium* is broken up into several genera, and our species appears as *Androgynia Huntii* Wood. There is no reference to the Prodromus, but only "*Syn.-Oedogonium Huntii* Wood, American Naturalist, 1868"; as we have seen, no such name appears in that periodical. Plate XVII, fig. 2, however, evidently represents the same thing as the figure in the Naturalist, and the text, p. 198, speaks of the alga as occurring in Wood's aquarium.

There seems to be nothing more known of the plant; Wolle[2] condenses Wood's description and copies his figures; Wittrock[3] adds nothing. DeToni[4] puts the description into Latin. Hirn[5] sum-

[1] So reads the title page; the running title throughout is Fresh-Water Algae of the United States, and this latter form is very generally used in citations referring to the work.

[2] Fresh Water Algae of the U. S., p. 85, Pl. LXXXIV, fig. 9, 1887.

[3] Oedogonieæ Americanæ, hucusque cognitæ; Bot. Notiser, p. 136, 1878.

[4] Sylloge Algarum, Vol. I, p. 60, 1889.

[5] Monographie und Iconographie der Oedogoniaceen, Acta Societatis Scientiarum Fennicae, Vol. XXVII, p. 208, 1900.

marizes what we have noticed, except the Am. Nat. and Prodromus citations, which were unknown to him; and copies Wood's figure as Pl. XXXIV, fig. 213. In a later paper[1] he completes his record by giving the two missing citations.

In Oct., 1906, Prof. F. D. Lambert called my attention to some algae growing in a sunken wooden tub near Tufts College, and on examination I found that among these were filaments bearing slender hairs like those represented in Wood's figures. Unfortunately there was no fruit, and soon after that time the water froze, and nothing more could be done. Visits in the spring of 1907 showed no fruit, but in Sept., 1907, considerable material was obtained with fairly plentiful but not quite mature fruit. The four spiral lines on the spore were not visible, but otherwise everything agreed with the descriptions. About a week later the station was visited in the hope that the ripe fruit might be found; the tub had been covered over and a path made across it; the locality was destroyed.

The identification cannot be considered as absolutely certain, but there is no described species that has the characters of the Tufts College plant, and these characters all agree with those of *Oe. Huntii* at the same stage of development, so that there is at least a strong probability of identity. The terminal hairs are very peculiar; they consist of a series of ten or more superimposed, long, cylindrical cells, each somewhat smaller in diameter than the one below; the effect is like that of a many-jointed spy-glass, pulled out to the full length, except that the terminal cell is much more slender in proportion to the basal cell; not a twentieth of the diameter. Several species are figured with terminal hairs in Hirn's monograph, but none at all resembling this. It is curious that though this structure is plainly shown in Wood's figures and their copies in later authors, descriptions all simply say "long apical seta" or some equivalent phrase. If any one should observe an *Oedogonium* with setae of this character, it is to be hoped that diligent care will be taken to obtain the mature fruit, and that no "improvements" will take place in that vicinity until the fruit is gathered.

Malden, Massachusetts.

[1] Studien ueber Oedogoniaceen, l. c., Vol. XXXIV, p. 38, 1906.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT—II.

THE local flora committee of the New England Botanical Club has continued to collect information as outlined in its first publication (RHODORA, ix. 81). Numerous botanists have contributed to the work by sending card-records regarding their specimens, and the collections of the Gray Herbarium, the Arnold Arboretum, and the New England Botanical Club have been personally examined. No doubtful records have in any case been included in the following list, and every species is represented by at least one herbarium specimen. Any additions will be welcomed, for the present list is regarded as by no means final.

There is need of much fuller information in regard to soil, moisture and other ecological factors, and future reports to the committee will be of greater value if they are more detailed than most of those we now have.

There is a large block of towns south of the Blue Hills, which are very little known botanically. We have no reports from the South Shore, and Bridgewater, Easton, Canton and Norfolk are the only inland towns which are well represented among our records for this section. The committee therefore urges upon the collectors of this district the importance of more detailed exploration south of the Blue Hills. The Committee will also try personally to collect in these towns as extensively as possible, but there is great need for coöperation in this part of the work.

The *Isoëtaceae* of this list have been contributed by Mr. A. A. Eaton of the Ames Botanical Laboratory. The committee wishes to thank Mr. Eaton for his zealous coöperation in this and other matters connected with the work.

MARSILEACEAE.

MARSILEA.

M. QUADRIFOLIA L. Introduced in muddy bottoms of lakes and streams; Charles and Concord Rivers; Glacialis and vicinity, Cambridge; Malden (1877, *Morong*); Boxford.

EQUISETACEAE.

EQUISETUM.

E. arvense L. Moist sand and gravel, occasional in richer soil. Very common and variable.

E. sylvaticum L. Wet fields and woods, frequent.

E. litorale Kühlewein. Wet shore of Merrimac River in Amesbury and Newburyport (*A. A. Eaton & Raynal Dodge*).

E. fluviatile L. (*E. limosum* L.) Stagnant water. Frequent, especially in northern portion of the district.

E. hyemale L., var. **affine** (Engelm.) A. A. Eaton. Moist soil, infrequent. (All the material examined is of this variety, which is distinguished from the typical form by having rounded instead of biangulate ridges).

E. scirpoides Michx. Wet clay bank under hemlocks, Amesbury (*A. A. Eaton*).

LYCOPODIACEAE.

LYCOPODIUM.

L. lucidulum Michx. Damp woods, frequent.

L. inundatum L. Wet sand, rare. Not reported south of Boston.

Var. **Bigelovii** Tuckerm. Swamps and borders of ponds, occasional.[1]

L. annotinum L. Rich woods, abundant in Essex and Manchester.

L. clavatum L. Dry woods, occasional.

L. obscurum L. Moist woods, occasional.

Var. **dendroideum** (Michx.) D. C. Eaton. As common as the typical form.

L. complanatum, L., var **flabelliforme** Fernald. Originally common in dry woods and pastures, but eradicated in many places.

L. tristachyum Pursh. (*L. complanatum*, var. *Chamaecyparissus* Milde.) Open woods and pastures. Abundant in a few localities, but not generally distributed.

[1] **Note. The plant reported from Plum Island, Newbury, as *L. alopecuroides* L. (Fern Bulletin v. 4) has been carefully examined, and the committee has decided it is not different from this variety.**

SELAGINELLACEAE.

SELAGINELLA.

S. rupestris (L). Spring. Dry rocks, rather common.

S. apus (L.) Spring. Wet places; locally abundant in northern portion, occasional elsewhere; probably often overlooked.

ISOËTACEAE.

ISOËTES.

I. Dodgei A. A. Eaton, var. **Robbinsii** A. A. Eaton. (*I. canadensis*, var. *Robbinsii* A. A. Eaton, RHODORA, v. 279. 1903.) In Mulberry Meadow Brook, Easton (*A. A. Eaton*).

I. Eatoni Dodge. In Tuxbury's Pond, Amesbury (*A. A. Eaton & Raynal Dodge*); in Parker River, Byfield (*Raynal Dodge*). Scarce.

I. echinospora Durieu, var. **Braunii** (Durieu) Engelm. Abundant throughout, mostly in mud, but sometimes on sandy shores and bottoms of ponds and large streams.

Var. **muricata** (Durieu) Engelm. Reported from twelve localities, covering the northern and southern limits of the district. Usually plentiful where found at all.

I. Engelmanni A. Br. In ponds and ditches, mostly over a clay subsoil; common in the northern part of the district, but not reported south of the Blue Hills.

I. foveolata A. A. Eaton, var. **plenospora** A. A. Eaton. In ponds, North Easton (*A. A. Eaton*). Plentiful.

?I. Gravesii A. A. Eaton. Arlington Brook (*Wm. Boott*). The specimens seen are fragmentary and unsatisfactory.

I. saccharata Engelm., var. **Amesii** A. A. Eaton. In ponds on gravelly bottom, North Easton (*A. A. Eaton*). Abundant.

I. Tuckermani A. Br. In ponds on sandy bottom, common.

? Var. **Harveyi** (A. A. Eaton) Clute. Fresh Pond, Cambridge (*Wm. Boott*). All material seen has been fragmentary and unsatisfactory.

(Note.— From the material examined, the genus would appear to

have a north-south distribution through the district, but this is doubtless more apparent than real. The genus has been little collected in the region except by Tuckerman, Boott, and others, who have lived in the neighborhood of Boston. When the western portions of the district have been thoroughly explored, they will probably yield a fair quota of species of this genus. *I. lacustris* L. and *I. riparia* Engelm. have been reported in the district, but I have personally examined material of all the collections referred to these species and find it to belong to other species.— A. A. Eaton.)

TAXACEAE.

TAXUS.

T. canadensis Marsh. Cold woods; abundant at a few stations.

PINACEAE.

PINUS.

P. Strobus L. Common. The best specimens are those in the Appalachian Club Reservation at Carlisle, where the forest has never been cut off.

P. rigida Mill. Dry sterile soil, very abundant throughout.

P. sylvestris L. Escaped from cultivation; Danvers (*John Robinson*, Flora of Essex Co., 1880); "trees of all sizes, and some escaped into the roadside, sandy soil" Newburyport, (*Raynal Dodge*); "very rare in mixed woods," Belmont (*A. H. Moore*).

P. resinosa Ait. Dry soil; found sparingly as far south as Chestnut Hill, Brookline.

LARIX.

L. laricina (Du Roi) Koch. Cold swamps, not common.

L. decidua Mill. Self-sown in Hemenway place, Canton (*E. F. Williams*).

PICEA.

P. rubra (Du Roi) Dietr. Abundant on rocky hillside near Cape Pond, Rockport (*J. H. Sears*); a single tree in Neponset River meadow, Milton, "in too wet land for an introduced tree" (*G. G. Kennedy*); a few trees in Randolph (*E. F. Williams, G. G. Kennedy*).

P. mariana (Mill.) B. S. P. Cold swamps; reported from eleven towns, mostly in northern portions of district.

P. ABIES (L.) Karst. (*P. excelsa* Link.) Spontaneous on west side of Blue Hill, evidently from large trees on the Hayward land (*G. G. Kennedy*).

ABIES.

A. BALSAMEA (L.) Mill. Reported from a few scattered stations but apparently not native in our range.

TSUGA.

T. canadensis (L.) Carr. Cold soil of rocky ridges and ravines, frequent.

CHAMAECYPARIS.

C. thyoides (L.) B. S. P. In very wet places throughout, usually forming "cedar swamps"; less common northward.

THUJA.

T. OCCIDENTALIS L. Reported from a few stations as introduced.

JUNIPERUS.

J. communis L., var. **depressa** Pursh. Dry sterile soil, very common. (True *J. communis* L. is arborescent, and has not been reported in our range).

J. horizontalis Moench (*J. Sabina,* var. *procumbens* Pursh). A single large specimen at the north base of Oldtown Hill, Newbury (*A. A. Eaton*). Probably the southern limit.

J. virginiana L. Dry soil throughout, common.

(Note.— Other extra-limital species of this family are likely to persist around old places, or occasionally to reproduce themselves. Those trees not known to have reproduced by seed are not included in this list.)

C. H. Knowlton,
J. A. Cushman,
Walter Deane,
A. K. Harrison,
} *Committee on local flora.*

FURTHER NOTES ON THE VASCULAR PLANTS OF THE NORTHEASTERN UNITED STATES.

B. L. Robinson.

In the February issue of Rhodora the writer put on record some new combinations which had been found essential to consistent usage in the work and publications of the Gray Herbarium. Several further combinations of similar nature are given below, together with their synonymy. Those relating to the grasses are published by the kind permission of their respective authors. In several cases these combinations, which have already appeared in the subspecific category, are here put on record in order that they may have also a technical accuracy in the varietal rank, it being likely that they will be so placed by many writers who, according to long-established usage maintain the two categories, subspecies and variety, as being to a certain extent distinct.

Sagittaria latifolia Willd., forma **hastata** (Pursh), n. comb. *S. hastata* Pursh, Fl. Am. Sept. ii. 396 (1814).

Panicum columbianum Scribn., var. **thinium** Hitchc. & Chase, n. comb. *P. unciphyllum*, var. *thinium* Hitchc. & Chase, Rhodora, viii. 209 (1906).

Panicum Boscii Poir., var. **molle** Hitchc. & Chase, n. comb. *P. latifolium*, var. *molle* Vasey, U. S. Dept. Agric. Div. Bot. Bull. viii. 34 (1889).

Panicum huachucae Ashe., var. **silvicola** Hitchc. & Chase in litt. quam forma typica altius gracilius laetiore viride minus pubescens;

laminis foliorum tenuibus laxis patentibus 5–10 cm. longis 6–10 mm. latis supra minus dense pilosis subtus appresse pubescentibus sericeis; panicula 5-8(–10) cm. longa, ramis patentioribus; spiculis ellipticis minus turgidis breviore pubescentibus; statu autumnale plus minusve decumbente, ramulis fasciculatis quam internodia principalia brevioribus. (*P. lanuginosum* as described by Scribner & Merrill, not Ell.) — Woods and clearings, range of the typical form, more common southward. Type, District of Columbia, *Chase*, no. 2400, in National Herbarium.

MUHLENBERGIA SCHREBERI Gmel., var. **palustris** Scribner in litt. *M. Schreberi*, subsp. *palustris* Scribner, RHODORA, ix. 17 (1907).

SPHENOPHOLIS OBTUSATA (Michx.) Scribner, var. **pubescens** (Scribner & Merrill) Scribner in litt. *Eatonia pubescens* Scribner & Merrill, Circ. U. S. Div. Agrost 27, p. 6 (1900). *S. obtusata*, subsp. *pubescens* Scribner, RHODORA, viii. 143, 144 (1906).

SPHENOPHOLIS OBTUSATA (Michx.) Scribner, var. **lobata** (Trin.) Scribner in litt. *Trisetum lobatum* Trin. Mém. Acad. Pétersb. sér. 6, i. 66 (1831). *S. obtusata*, subsp. *lobata* Scribner, RHODORA, viii. 143, 144 (1906).

SPHENOPHOLIS NITIDA (Spreng.) Scribner, var. **glabra** (Nash) Scribner in litt. *Eatonia glabra* Nash in Britton, Man. 1043 (1901). *S. nitida*, subsp. *glabra* Scribner, RHODORA, viii. 143, 145 (1906).

SPHENOPHOLIS PALLENS (Spreng.) Scribner, var. **major** (Torr.) Scribner in litt. *Koeleria truncata*, var. *major* Torr. Fl. U. S. 117 (1824). *S. pallens*, subsp. *major* Scribner, RHODORA, viii. 143, 145 (1906).

SPHENOPHOLIS PALUSTRIS (Michx.) Scribner, var. **flexuosa** Scribner in litt. *S. palustris*, subsp. *flexuosa* Scribner, RHODORA, viii. 143, 145 (1906).

TRISETUM MELICOIDES (Michx.) Vasey, var. **majus** Hitchc., n. comb. *Graphephorum melicoides*, var. *major* Gray, Ann. Bot. Soc. Can. i. 57 (1861) & Proc. Am. Acad. v. 191 (1861).

PUCCINELLIA **Borreri** (Bab.) Hitchc., n. comb. *Festuca Borreri* Bab. Trans. Linn. Soc. xvii. 565 (1837).

FESTUCA RUBRA L., var. **prolifera** Piper in litt. *F. rubra*, subsp. *prolifera* Piper, Contrib. U. S. Nat. Herb. x. 21 (1906).

ELYMUS VIRGINICUS, var. **hirsutiglumis** (Scribn.) Hitchc. in litt. *E. hirsutiglumis* Scribn. U. S. Dept. Agric. Div. Agrost, Bull. xi. 58 (1898).

Amaranthus hybridus, forma **hypochondriacus** (L.), n. comb. *A. hypochondriacus* L. sp. Pl. ii. 991 (1753). *A. hybridus*, var. *hypochondriacus* Robinson, Rhodora, x. 32 (1908), by clerical error.

Actaea rubra (Ait.) Willd., forma **neglecta** (Gillman), n. comb. *A. neglecta* Gillman in Lloyd, Drugs and Medicines, 235 (1884–5). *A. eburnea* Rydb. Mem. N. Y. Bot. Gard. i. 153 (1900). This is the problematic *Actaea*, seemingly merely a color form of *A. rubra*, which has white berries on slender pedicels.

Bacopa **acuminata** (Walt.), n. comb. *Gratiola acuminata* Walt. Fl. Car. 61 (1788). *Maturea nigrescens* Benth. Comp. Bot. Mag. i. 173 (1835). *Herpestis nigrescens* Benth. Comp. Bot. Mag. ii. 56 (1836). *Monniera acuminata* Ktze. Rev. Gen. ii. 463 (1891). This new combination and the next are necessitated by the legalization of *Bacopa* through its inclusion in the list of nomina conservanda of the Vienna Rules.

Bacopa **caroliniana** (Walt.), n. comb. *Obolaria caroliniana* Walt. Fl. Car. 166 (1788). *Monniera amplexicaulis* Michx. Fl. Bor. Am. ii. 22 (1803). *Herpestis amplexicaulis* Pursh, Fl. Am. Sept. 418 (1814). *Monniera caroliniana* Ktze. Rev. Gen. ii. 463 (1891).

Ilysanthes. For some years it has been known that there are two kinds of *Ilysanthes* growing in the northeastern United States. Whether these are to be regarded merely as varieties of the same species or are better treated as fairly independent species is still to some extent an open question. For the latter course it may be urged that the ranges of the two are not entirely identical, that the differences of the plants in question, when once understood, are pretty readily seen, and finally that the copious material of the two, collected during recent years, instead of showing further evidence of intergradation, tends rather to prove a fairly high degree of constancy in their differences. Accepting at least provisionally the view that these plants are better treated as species, we are confronted with the problem of their specific nomenclature. The plants in our present discussion may be distinguished as I and II with the following salient distinctions.

I. Leaves relatively large, ovate to oblong; lower pedicels only about as long as the subtending leaves or shorter; calyx-lobes linear about equalling or slightly exceeding the ellipsoidal pod.

II. Leaves smaller; pedicels long and filiform, even the lower ones much exceeding the subtending leaves; calyx-lobes somewhat shorter than the pod.

In his paper on the North American Species of Ilysanthes, Bull. Torr. Bot. Club, xxiii. 296 et seq. (1896), Dr. J. K. Small treats plant II as *S. gratioloides* (L.) Benth. and makes for plant I a new combination *I. attenuata* (Muhl.) Small, regarding it identical with *Lindernia attenuata* Muhl. Cat. 59 (1813).

Some years later Dr. J. H. Barnhart, Bull. Torr. Bot. Club, xxvi. 376 (1899), calls attention to the fact that the name *I. gratioloides* (L.) Benth., founded upon *Capraria gratioloides* L. Sp. Pl. ed. 2, ii. 876 (1763), must give place to *I. dubia* (L.) Barnhart, founded upon the earlier and identical *Gratiola dubia* L. Sp. Pl. i. 17 (1753). It is to be noticed that subsequent writers, *e. g.* Britton, Man. 830 (1901), have assumed that Dr. Barnhart as well as Dr. Small regarded the Linnaean species (founded upon Clayton's no. 164 collected in Virginia) as being the small-leaved long-pediceled form which we have called plant II. However, the description which Gronovius himself gave of this plant of Clayton's, — see Gronovius, Fl. Virg. 73, 129 (1739), — contains the significant words *pedunculis solitariis unifloris longitudine foliorum*, an expression strongly pointing to its identity not with plant II but with plant I. To make sure of this identity the writer applied to Mr. E. G. Baker of the British Museum of Natural History to examine the still extant specimen of Clayton. This he most kindly did and sent a tracing of it to the Gray Herbarium showing conclusively its identity with the larger-leaved relatively shorter-pediceled form, which Dr. Small has called *I. attenuata*.

In the light of this new information the two species in question would seem to require the following nomenclatorial treatment.

I. I. DUBIA (L.) Barnhart, Bull. Torr. Bot. Club, xxvi. 376 (1899), as to actual Linnaean type. *Gratiola dubia* L. Sp. Pl. i. 17 (1753). *Capraria gratioloides* L. Sp. Pl. ed. 2, ii. 876 (1763). *Lindernia attenuata* Muhl. Cat. 59 (1813). *Gratiola attenuata* Spreng. Syst. i. 39 (1825). *I. gratioloides* Benth. in DC. Prodr. x. 419 (1846). *I. riparia* of many auth., at least in part, probably not of Raf. *I. gratioloides*, var. *curtipedicellata* Bush, Bull. Torr. Bot. Club, xxi. 494 (1894). *I. attenuata* Small, Bull. Torr. Bot. Club, xxiii. 297 (1896).

II. **I. anagallidea** (Michx.), n. comb. *Gratiola anagallidea* Michx. Fl. Bor. Am. i. 6 (1803). *Lindernia dilatata anagallidea* Muhl. Cat. 59 (1813). *L. pyxidaria* Pursh, Fl. Am. Sept. 419 (1814). ? *I. riparia* Raf. Ann. Nat. 13 (1820). *I. dubia* of auth., not of Barnhart as to the Linnaean type.

RUDBECKIA SPECIOSA Wenderoth, var. **Sullivanti** (Boynton & Beadle), n. comb. *R. Sullivanti* Boynton & Beadle, Biltmore Bot. Stud. i. 15 (1901).

COREOPSIS MAJOR Walt., var. **stellata** (Nutt.), n. comb. *C. stellata* Nutt. Journ. Acad. Philad. vii. 76 (1834). *C. senifolia*, var. *stellata* T. & G. Fl. ii. 342 (1842). *C. major*, var. *Oemleri* Britton, Mem. Torr. Bot. Club, iv. 131 (1894). *C. Oemleri* Ell. Sk. ii. 435 (1823). The name *stellata* must be taken up in place of *Oemleri* as the varietal designation since it has priority in the category in which it is here used.

ACTINEA **herbacea** (Greene), n. comb. *Actinella scaposa*, var. *glabra* Gray, Man. ed. 5, 263 (1867). *Tetraneuris herbacea* Greene, Pittonia, iii. 268 (1898).

NOTES ON THE GENUS SENECIO.

J. M. GREENMAN.

DURING the season of 1904 Messrs. J. F. Collins, M. L. Fernald and A. S. Pease collected in the Province of Quebec several Senecios which were referred to the writer for identification. One of these appeared to be intermediate in general aspect between *Senecio aureus* L. and *S. Balsamitae* Muhl., and upon a detailed study it was characterized as a probable hybrid between these species; publication was suspended, however, in the hope that further collections from different localities would produce additional material giving cumulative evidence of hybridity.

In June of last year the writer, while botanizing near Lake Michigan in the vicinity of Beach, Lake County, Illinois, found a large colony of *Senecio Balsamitae* growing in sandy soil, and near by in moist situations *Senecio aureus* L. was also relatively abundant. Associated with these two species in low wet meadows in limited number was noticed a peculiar Senecio intermediate in size and foliar characters between the two species mentioned. This form has since been examined more in detail, and the intermediate characters were found to extend to the different parts of the head. Moreover, upon com-

parison of my plant with the specimens secured in eastern Quebec by Collins, Fernald and Pease the two appear to be identical. On the whole there is every reason to believe that the plant in question is a natural hybrid, and it seems worthy of characterization as follows:

Senecio aureus > × **Balsamitae**, n. hyb., caulibus erectis 2.5–8 dm. altis glabratis vel sparse lanato-tomentosis; foliis inferioribus petiolatis oblongo-rotundatis vel oblongo-ovatis vel subellipticis 1–6 cm. longis 1–3.5 cm. latis, apice rotundatis vel obtusis marginibusque crenato-dentatis vel rarius acute-dentatis, basi subcordatis vel abrupte contractis et cuneatis superioribus lyratis vel laciniato-pinnatifidis; petiolis 2–15 cm. longis gracilibus; achaeniis glabratis vel sparse pilosis.— Stem erect, 2.5 to 8 dm. high, glabrous or nearly so; lower leaves oblong-rotund to oblong-ovate or subelliptic, 1 to 6 cm. long, 1 to 3.5 cm. broad, rotund to obtuse at the apex, crenate-dentate or occasionally rather sharply toothed, the earliest subcordate, the later either abruptly or rather gradually contracted at the base into the petiole; petioles 2 to 15 cm. long, slender; stem-leaves lyrate to laciniate-pinnatifid; inflorescence few to many-headed: heads medium sized: achenes glabrous or sparingly pilose, about one-third approximately developing perfect embryos.— Wet alluvial shores between Baldié and the Baie des Chaleurs, Bonaventure River, Province of Quebec, 5, 6, and 8 August, 1904, *Collins, Fernald & Pease* (hb. Gray); in low wet meadows, vicinity of Beach, Lake County, Illinois, 16 June, 1907, *Greenman*, nos. 1991, 2022 (hb. Field Mus.). Associated with the two parent species, and intermediate in size, leaf-outline and in technical characters of the head, bearing rather more the general aspect, however, of *S. aureus*.

Senecio Balsamitae Muhl., var. **Crawfordii** (Britton), n. comb. *S. Crawfordii* Britton, Torreya, i. 21 (1901). This plant, although at first taken to be distinct from *S. Balsamitae* Muhl., upon the examination of a large series of specimens can scarcely be regarded as of more than varietal rank. Its somewhat more luxuriant growth, than is characteristic of typical forms of the species, is most probably due to the moist rich habitat in which it was growing.

Field Museum of Natural History, Chicago.

NOTES ON HABENARIA.

Oakes Ames.

Habenaria dilatata var. **media** (Rydb.) n. comb.— *Limnorchis media* Rydb. Bull. Torr. Bot. Cl. **28**: 618 (1901).

The original specimen on which *H. dilatata* was based is in the herbarium of the British Museum. It was collected by Sir Joseph Banks in Newfoundland in 1766, and described by Pursh as *Orchis dilatata* in his Flora Americae Septentrionalis. The common New England form is considerably taller than the Banksian specimen and might readily be taken for a distinct species if it were not for perfect agreement in specific details. Strangely enough the form characteristic of the type is extremely rare in herbaria and is best matched by a series of specimens collected in high alpine bogs on Mt. Albert, Gaspé Co., Quebec, where they were found in August, 1905, at an altitude between 900 and 1050 meters by Collins and Fernald. The range of variation between the type and the luxuriant specimens frequently found in New England is sufficiently enormous to induce caution where new species are contemplated. *H. dilatata* is a widely distributed species and consequently adaptable to conditions which have a marked influence on growth. An examination of large quantities of material has convinced me that Dr. Rydberg's *Limnorchis media* is simply a variety of *H. dilatata* characterized by yellowish-green flowers. The labellum is slightly rhombic-lanceolate and the rostellar glands are similar to those of *H. dilatata.* The living specimens which I have examined have all been deliciously fragrant as is the case with typical *H. dilatata.*

Habenaria blephariglottis var. **conspicua** (Nash) n. comb.— *H. conspicua* Nash Bull. Torr. Bot. Cl. **23**: 100 (1896) — *Blephariglottis conspicua* Small Fl. Se. U. S. 313 (1903).

This variety differs from the type mainly in its longer spur, and is the common form in the southern states.

H. × Canbyi hybr. nov. (*H. cristata* × *H. blephariglottis*).

This interesting natural hybrid was collected near Lewes, Delaware in July, 1878, by Wm. M. Canby. At the time it was discovered its hybrid origin was suspected. The following transcript from the collector's notes is of interest:

"*Habenaria cristata* × *blephariglottis*? Intermediate in color, size of flowers, openness of panicle, etc. between the two species. Hab., Swamp near Lewes, Delaware, in company with *H. cristata* and *H. blephariglottis*, July 27, 1878."

The labellum of the hybrid is more or less ragged-fringed, 7 mm. long, more closely resembling *H. cristata* than *H. blephariglottis*. The length of the spur is 12 mm. and consequently of very great diacritical value, as in combination with other characters more or less intermediate between the parent species it excites that suspicion as to origin which usually results in the detection of natural hybrids.

The foliage is intermediate.

Type in Hb. College of Pharmacy, New York City.

North Easton, Massachusetts.

Preliminary Lists of New England Plants,— XIX. Addenda.— Since the publication of "Preliminary Lists of New England Plants,— XIX." (Rhodora, **8**: 131, July, 1906), several new records for some of the mosses there listed have been reported to the writer, in most cases accompanied by specimens. To bring this list to date the additions and corrections noted below should be incorporated.

In Rhodora (**4**: 239) Mr. A. LeR. Andrews records finding *Buxbaumia indusiata* Brid. on Mt. Greylock, Mass. In the manuscript for the original list a dash (—), based upon this record, appears in the column for Massachusetts, but through some oversight in proofreading its omission in the printed list passed unnoticed. It should be inserted.

Catharinaea Macmillani Holz. was originally described by Professor J. M. Holzinger, in 1903,[1] from sterile specimens collected in Minnesota. In Rhodora (**9**: 98) Mr. E. B. Chamberlain fully described both gametophyte and sporophyte of this species and published illustrations, together with complete data in regard to its discovery in New England. A cross (+) should be inserted in the "Me." column and a dash (—) in the "Conn." column.

Catharinaea crispa James has been collected by Miss A. L. Crockett

[1] Minn. Bot. Studies, **3**: 120.

in Camden, Maine, as recorded in Rhodora (9:74), and in East Hartford, Connecticut, by Mr. C. A. Weatherby. A cross should be inserted in both the columns indicated.

Pogonatum alpinum var. *arcticum* (Sw.) Brid. In June, 1906, Professor Fernald and the writer made a brief visit to Salisbury, Connecticut, where, in Sage's Ravine, a few sterile specimens of this moss were collected, but they were not determined until later in the year, after the printed list appeared. According to government maps of this ravine the specimens undoubtedly grew in Connecticut, though only a few rods from the Massachusetts boundary.

Polytrichum commune var. *perigoniale* (Mx.) Bry. Eur. Specimens of this variety, collected in Vermont, are in the herbarium of Dr. Abel J. Grout, this state being the only one from which it had not been seen at the time the list was published.

Polytrichum gracile Dicks. was recorded from the Rangeley Lakes, Maine, in Rhodora (9:64) by Mrs. E. M. Dunham. As there stated the specimens examined by the writer were not quite typical. A cross (+) should be used in recording the last three mosses.— J. Franklin Collins, Providence, Rhode Island.

Euclidium syriacum in Massachusetts.— On June 23, 1907, while collecting in Dedham, Mass., I came across an abandoned henyard. Here, with *Erysimum cheiranthoides* L. and *Lepidium apetalum* Willd., grew one specimen of a peculiar plant which I did not recognize as a crucifer. With the assistance of Dr. B. L. Robinson I have identified the plant as *Euclidium syriacum*, R. Br., a field plant ranging from lower Austria and Russia to Persia, Baluchistan and Cashmere. The following description may lead to further reports of this waif, which so far as I know has never been reported in this country before. The specimen I have given to the Gray Herbarium.

Branching, hairy, 3 dm. tall; leaves 2.5–3 cm. long, alternate, rough, with small distant denticulations; flowers inconspicuous, yellow scattered on naked tips of branches; fruit densely rough-pubescent, 2–4 mm. long, with an abruptly reflexed beak of nearly the same length; seeds few.— C. H. Knowlton, Boston, Mass.

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THE CRATAEGI OF THE NORTHEASTERN UNITED STATES AND ADJACENT CANADA.

W. W. Eggleston.

The genus *Crataegus* presents an interesting problem, and one for the study of which we are just beginning to get sufficient data. Up to ten years ago the American species of this genus were much better known in European botanical gardens than at home; and one of the most vexing problems of the present in regard to the group is to know precisely what has been meant by the species described in Europe.

In preparing a treatment of the genus soon to be issued I have endeavored, first to give a clear characterization of the different sections, with good keys; second to take up the more important published species and varieties, without even pretending to deal with every form that may prove worthy of recognition. Much more thorough work needs to be done in the field, and careful cultural experiments will have to be made, before the genus can be exploited finally.

The part of northeastern North America that really needs the most exploration in connection with this genus is southern Virginia, east of the Blue Ridge. Here should be found a number of the *Flavae* and other southern forms. Profitable work, however, can still be done all over the northeastern states and in adjacent Canada, both in extending the known ranges of old species and in finding new forms.

In my judgment much of the trouble found in *Crataegus* arises from hybridization, and why may not mutation be another disturbing element? Along these lines there is a fine field for experimental work. Unhappily, such investigation in the case of *Crataegus* offers much greater difficulty than in *Viola* where the whole life history can be observed within a year or so. In *Crataegus* it would require perhaps

eighteen months for the germination of the seed and from eight to ten years to secure mature fruit from the first generation. Thus one would need the equipment and backing of an arboretum to carry on such work on a scale sufficiently extended to secure definite results.

So far as known, the genus produces plenty of good seed, and the plantations at Biltmore, the Arnold Arboretum, and my own, at the New York Botanical Garden, have shown that the forms of the genus reproduce themselves surprisingly true from seed. Yet, further experiments are greatly to be desired, in which *all* the seed from a single tree are retained and raised to maturity. When this is tried, it will be surprising indeed if *Crataegus* differs from other members of the Rose Family, which are so notoriously susceptible to crossing.

The genus is so variable that it is impossible to find characters which will hold absolutely true, either between species or even sections; then again, characters which seem to hold good in one section are useless in the next. Thus in the *Molles* and *Coccineae* certain species have cordate leaves on their vegetative shoots, but in the *Tenuifoliae* and *Pruinosae* both cordate and wedge-shaped leaves occur on the same plant.

The best time to study *Crataegi* is when they are in mature fruit. Often it is impossible to name dried flowering material closer than to one of two groups, while mature fruiting material, even in the dried state, would easily settle the species. This case holds particularly true between the *Tenuifoliae* and *Pruinosae*, the *Coccineae* and *Molles*, the *Macracanthae* and *Anomalae*.

Personally I am fast losing confidence in the number of stamens as a reliable diagnostic character. It is true that in a general way the flowers of many species seem to have prevailingly 5–10 stamens or 10–20 stamens, but both 10-stamened and 20-stamened flowers sometimes are found on the same tree; and material is fast accumulating which seems to show that for every 10-stamened form somewhere a similar form will occur with 20 stamens, and the reverse.

In a general way color of anthers seems to be correlated with color of the immature foliage; thus yellow anthers go with yellow-green leaves, pink anthers with bronze-green leaves; and the different sections have their own particular color. For instance, the only constant difference between the *Coccineae* and the *Molles* is this color difference, all other distinctions breaking down at some point; but even this character must be employed with caution, particularly if

there are hybrids in the genus, for plants are often encountered which have seemingly the wrong anther-color; thus *Pruinosae* and *Tenuifoliae*, which habitually have pink anthers, occasionally exhibit yellow anthers. In the North one would naturally investigate these as probable crosses with the *Rotundifoliae*, *Intricatae*, or *Molles*. The section *Macracanthae* is one of the most easily distinguished because the nutlets have pits on their inner faces, and naturally a hybrid between one of the *Macracanthae* and a species with plane nutlets would be marked. One would expect in such a form nutlets with pits of all degrees of depth, and forms of this sort are in fact often found in nature.

One of the best places to study *Crataegus* hybrids is in the Northwest, where there are only three groups represented, one with black fruit, the others with red. In this region forms with brown or chestnut-colored fruit are found, but they are relatively so scarce as to suggest hybrid origin.

Although anther-color seems to be of value in determining *Crataegi*, it is a distinction which cannot be used in the case of dried material, and even in the live plants it is of such short duration that I have left it out of my keys.

Reliable characters are to be found in the fruits, number of nutlets, sculpture of the nutlets, and consistency of the flesh, whether hard or soft at maturity, and form of the calyx, while even the leaves and sepals are of more permanent aid to us than the color character.

In sectional names the oldest known have been used. Fortunately only one section had to be renamed. For this I used the name of the oldest as well as the most characteristic species, as follows:

Rotundifoliae, n. nom. *Coccineae* Sarg. Man. Trees N. A. 366 (1905), not Loudon, Arb. et Frut. Brit. **2**: 816 (1838).

Other notes and nomenclatorial changes which it seems best to put on record together with synonymy and bibliography are as follows:

C. CRUS-GALLI L., var. **exigua** (Sarg.), n. comb. *C. exigua* Sarg. Rhod. **5**: 52 (1903).

C. CRUS-GALLI L., var. PRUNIFOLIA (Poir.) Loud. Arb. et Frut. Brit. **2**: 821 (1838). *Mespilus prunifolia* Poiret, Encyc. Method. **4**: 443 (1797) and in Nouveau Duhamel Traité des Arbres et Arbust. **4**: 150, t. 40 (1809). *C. attenuata* Ashe, Jour. Elisha Mitchell Soc. **19**: pt. 1, 30 (1903). This variety seems to have been subject to a mistaken interpretation, which needs revision. Poiret's description

and plate call for a glabrous form of *C. Crus-galli* with rather broad and somewhat acute-pointed leaves. The form occurring at Port Huron, Mich., and Windsor, Ontario (*C. attenuata* Ashe) exactly fits this plate. It is to be noted that *M. prunifolia* Poiret originally came from Canada. Furthermore as *C. Crus-galli* is an extremely rare form in Canada, this southern Ontario region being the only place where it is known to occur native, the evidence seems very clear that this particular form is the original of var. *prunifolia*. Unfortunately the name *prunifolia* after Poiret's time was transferred both in botanical gardens and in literature to a broad-leaved form of *C. Crus-galli* with pubescent leaves and corymbs (see for instance DeCandolle, Torrey and Gray, etc.).

C. Crus-galli × **macracantha**, n. hybr. Certain broad-leaved individuals with foliage as in *C. Crus-galli*, var. *prunifolia*, the corymbs pubescent, the calyx-lobes serrate, the nutlets 2–3, their pits varying from shallow to deep, have all the appearance of being natural hybrids between these two species. (*C. persimilis* Sarg.; *C. prunifolia* of European gardens, in part.) — Occasional.

C. BERBERIFOLIA T. & G., var. **Engelmanni** (Sarg.), n. comb. *C. Engelmanni* Sarg. Bot. Gaz. **31**: 2 (1901).

C. COLLINA Chapm., var. **sordida** (Sarg.), n. comb. *C. sordida* Sarg. Bot. Gaz. **33**: 114 (1902).

C. COLLINA Chapm., var. **Lettermani** (Sarg.), n. comb. *C. Lettermani* Sarg. Bot. Gaz. **31**: 220 (1901).

C. APPOSITA Sarg., var. **Bissellii** (Sarg.), n. comb. *C. Bissellii* Sarg. Rhod. **5**: 65 (1903).

The name C. COCCINEA has been applied to many different plants both by Linnaeus himself and by later authors. Linnaeus, Sp. Pl. ed I, **1**: 476 (1753), thus describes *C. coccinea*: —

"CRATAEGUS foliis ovatis repando angulatis serratis glabris. *Hort. cliff.* 187 [1737]. *Hort. Ups.* 126 [1748]. *Gron. virg.* 54 [1739]. *Roy. lugdb.* 272 [1740].

Mespilus, apii folio virginiana spinis horrida, fructu amplo coccineo. *Pluk. Alm.* 249. *t.* 46. *f.* 4 [1691].

Mespilus spinosa s. Oxyacantha virginiana maxima. *Angl. hort.* [Catalogus plantarum....quae in hortis non procul a Londino propagantur] 49. *t.* 13. *f.* 1 [1730].

Habitat in Virginia, Canada.

Variat cum validis spinis lateralibus & absque spinis."

Here the first three paragraphs undoubtedly refer to three distinct species, belonging to three sections of the genus. The plant of the first paragraph is represented in the British Museum by a small fragment of Plukenet's labeled as of t. 46, f. 4, and supposed to have come from Virginia. This Plukenet specimen is so incomplete that it is impossible to determine the species to which it belongs. See Sarg. Bot. Gaz. **31**: 12 (1901). My photograph of this type seems clearly to represent a form of the group *Coccineae* Loud. For further confirmation of this view, see Miller, Dict. ed. I, no. 8 (1731), ed. VII, nos. 7 and 8 (1759), ed. VIII, no. 4 (1768); Aiton, Hort. Kew. ed. I, **2**: 167 (1789); Watson, Dendr. Brit. **1**: t. 62 (1825); Hook. Bot. Mag. t. 3432 (1835); Loud. Arb. et Frut. Brit. **2**: 816 (1838); and T. & G. Fl. N. A. **1**: 465 (1840).

Plate 3432 in the Botanical Magazine represents a flowering specimen with pink anthers and ten stamens, which must have been very near either *C. pedicillata* or *C. polita* Sarg. This seems good evidence for *C. coccinea* Mill. and for the section *Coccineae* Loud. But the Plukenet type is so incomplete as to be undeterminable and might easily belong in the section *Molles* as Prof. Sargent (Bot. Gaz. **31**: 12, 1901) thinks, and therefore this vague element in the composite should be ignored if there is another covered by the Linnaean description which we can determine. Happily this is the case and it is possible to identify both the other elements included by Linnaeus under the composite *C. coccinea* of the first edition of his Species Plantarum. The second plate cited by Linnaeus, namely, a fine colored one in Angl. Hort. 49, t. 13, f. 1 (1730), is unmistakably *C. Phaenopyrum* (L. f.) Medic. This species, under any rule can be eliminated from the question if we can determine the species represented by the first plate. This first plate, Pluk. Alm. 249, t. 46, f. 4, has been variously interpreted. It was, without much doubt, drawn from material collected by Banister in Virginia (Chesapeake Bay region). These Banister-Plukenet types are preserved in the British Museum, as is also the later material collected by Clayton in Virginia. Mr. James Britten kindly sent me photographs of these *Crataegus* types, but the one supposed to be the original of t. 46, f. 4 I saw at once could not have been used to make this plate. Mr. Britten made another search and found an unnumbered specimen of Plukenet's that he says does exactly match the plate. This is fortunately in mature fruit. Mr. Britten was so kind as to send me one of the fruits and this at once

decided the question. It is a red-brown pubescent fruit with firm flesh, and, when the type of leaves is considered, can represent no other American thorn than *C. modesta* Sarg. These facts, together with the circumstance that the form in question is one of the few known from the Chesapeake Bay region ought to settle the status of *C. coccinea* L.

This species seems to have been rarely collected by the early American botanists. It is represented in the Torrey herbarium (N. Y. Bot. Gard.) by a specimen from West Point, N. Y. (1825), in regard to which Dr. Gray recorded the opinion that this was exactly the *C. glandulosa* of Pursh as seen in the Barton herbarium.

The following synonyms appear to belong to this species: — *C. coccinea*, var. *viridis* T. & G. Fl. N. A. **1**: 465 (1840), in part. *C. intricata* J. Lange, Bot. Tidssk. **19**: 264 (1895). *C. modesta* Sarg. Rhod. **3**: 28 (1901). *C. premora* Ashe, Ann. Car. Mus. **1**: 391 (1902).

The history of *C. coccinea* is rendered still more complex by the fact that Linnaeus in subsequent publications included in his species still other elements. Thus in the second edition of the Species Plantarum (1762) he added the description and cited the plate of Miller's *Mespilus cordata*. Finally in the Mantissa altera, 397 (1771) he gives a description which points to still a fifth species and group, namely to the plant here called *C. rotundifolia*, var. *Faxoni*. This last is the form taken up by Prof. Sargent for *C. coccinea* (Bot. Gaz. **31**: 12, 1901).

It would take a small volume to discuss critically the forms taken up by authors since the time of Linnaeus for *C. coccinea*. Indeed the species has been made a sort of general dumping ground for unknown forms.

C. TOMENTOSA L. *C. uniflora* Muench. Hausv. **5**: 147 (1770). *C. parvifolia* Ait. Hort. Kew. ed. I, **2**: 169 (1789). *C. tomentosa* is another badly interpreted species. It also came from the Chesapeake Bay region (*Banister*) and as published by Linnaeus is a composite. The first paragraph relating to the species in L. Sp. Pl. ed. I, **1**: 476 (1753) "Craetaegus foliis cuneiformi-ovatis serratis subangulatis subtus villosis, ramis spinosis. Habitat in Virginia" can refer to but one plant of this region; while the expression "ramis spinosis" will not fit the form *C. tomentosa* T. & G., and this form does not occur in the Chesapeake Bay region. In Sp. Pl. ed. II, **1**: 682 (1762), Linnaeus adds "Mespilus virginiana, grossulariae foliis. Pluk. phyt.

100. f. 1." Of this plate Plukenet, Alm. 249 (1696) says: "Mespilus Virginiana grossulariae foliis, fructu rubro minore, Phytogr. Tab. 100. f. 1. an Oxyacanthus folio parvo subrotundo, flore unico, theca foliacea incluso summitatibus ramulorum insidente *Banisteri*." This unmistakably places the species, as there is only this one-flowered species in the region. See also Miller's Dict. ed. VIII (1768) under *C. tomentosa* L., as also Michaux, etc., for further confirmation of our views.

C. TOMENTOSA L., var. **Smithii** (Sarg.), n. comb. *C. Smithii* Sarg. Trees and Shrubs, **1**: 67, t. 34 (1903).

C. COLUMBIANA Howell, var. **Piperi** (Britton), n. comb. *C. Piperi* Britton, Torreya, **1**: 55 (1901).

C. COLUMBIANA Howell, var. **Brunetiana** (Sarg.), n. comb. *C. Brunetiana* Sarg. Rhod. **5**: 64 (1903).

C. IRRASA Sarg., var. **Blanchardi** (Sarg.), n. comb. *C. Blanchardi* Sarg. Rhod. **7**: 218 (1905).

C. ROTUNDIFOLIA Moench, var. **Bicknellii**, n. var. foliis ad apicem modice acute lobatis; corymbis paullo villosis mox glabris; calycis lobis longis laciniatis persistentibus ad maturitatem fructus; nucellis saepissime 4–5.— Leaves somewhat sharply lobed towards the apex; corymbs slightly villous, soon glabrous; calyx-lobes long, laciniate, persistent on the fruit; nutlets usually 4–5.— Nantucket, Mass.: Wauwinet, June 5, 1900 (in flower), *Miss Mary A. Day*, no. 76; Polpis, September 5, 1904, *E. P. Bicknell* (type, in Herbarium of the New York Botanical Garden); also Quaise, September 19, 1907, *E. P. Bicknell*. Mr. Bicknell says "this is a round-topped shrubby tree, sometimes 3 m. high, of which I know only a few individuals."

The only other native thorn that I have seen from Nantucket is a specimen of the *Intricatae* (in leaf only), collected by Mr. Bicknell. This is likely to be *C. apposita* Sarg.

C. ROTUNDIFOLIA Moench, var. **Faxoni** (Sarg.), n. comb. *C. Faxoni* Sarg. Rhod. **5**: 161 (1903). *C. coccinea* of the Linnaean Herbarium in part. See Sarg. Bot. Gaz. **31**: 12 (1901); L. Sp. Pl. ed. III, **1**: 682 (1764).

C. ROTUNDIFOLIA Moench, var. **chrysocarpa** (Ashe), n. comb. *C. chrysocarpa* Ashe, Bull. N. Car. Agric. Coll. **175**: 110 (1900).

C. Marshallii, n. nom. *Mespilus apiifolia* Marsh. Arb. 89 (1785). *C. apiifolia* Michx. Fl. **1**: 287 (1803), not Medic. Gesch. 83 (1793).

C. LUCORUM Sarg., var. **insolens** (Sarg.), n. comb. *C. insolens* Sarg. Rhod. **7**: 217 (1905).

C. MACROSPERMA Ashe, var. **pentandra** (Sarg.), n. comb. *C. pentandra* Sarg. Rhod. **3**: 25 (1901).

C. MACROSPERMA Ashe, var. **demissa** (Sarg.), n. comb. *C. demissa* Sarg. Rhod. **5**: 139 (1903).

C. MACROSPERMA Ashe, var. **pastorum** (Sarg.), n. comb. *C. pastorum* Sarg. Rhod. **3**: 24 (1901).

C. MACROSPERMA Ashe, var. **matura** (Sarg.), n. comb. *C. matura* Sarg. Rhod. **3**: 24 (1901).

C. MACROSPERMA Ashe, var. **acutiloba** (Sarg.), n. comb. *C. acutiloba* Sarg. Rhod. **3**: 23 (1901).

C. Grayana, n. sp., foliis flabellatis 3–8 cm. longis 2–7 cm. latis basi cuneatis vel truncatis apice acuminatis simplice vel duplice serratis, dentibus parvis rectis, lobis 4–5-jugis acuminatis saepe recurvatis; foliis junioribus supra et subtus in veniis paullo appresse pubescentibus mox glabratis membranaceis supra obscure viridibus subtus pallidioribus; petiolis gracilibus 1.5–3 cm. longis glabris; corymbis multifloris paullo villosis, floribus 1.5–1.8 cm. latis; tubo calycis subtus villoso supra glabro, lobis lanceolatis acuminatis circa 5 mm. longis glabris integris vel remote glandularibus; staminibus circa 20, antheris roseis; stylis 3–5 basi tomento pallido circumdatis; fructu subgloboso vel breviter ellipsoidali angulari 10–15 mm. crasso atrorubenti paullo villoso sed glabrato; pericarpio crasso farinaceo flavo; sepalis patentibus persistentibus; nucellis plerisque 4–5, dorso carinatis, 6–7.5 mm. longis, fasciculo nucellarum 6–8 mm. crasso.— Leaves flabellate, 3–8 cm. long, 2–7 cm. wide, cuneate to truncate at the base, acuminate at the apex, simply or doubly serrate with fine straight teeth, with 4–5 pairs of acuminate often recurved lobes; young leaves with a straight appressed pubescence above and along the veins beneath, becoming glabrous, membranaceous, dull green above, paler beneath; petioles slender, 1.5–3 cm. long, glabrous; corymbs many-flowered, somewhat villous; flowers 1.5–1.8 cm. wide; calyx-tube villous below, glabrous above; calyx-lobes lanceolate, acuminate, about 5 mm. long, glabrous, entire or remotely glandular; stamens about 20; anthers pink; styles 3–5, surrounded at the base by pale tomentum; fruit subglobose to short-ellipsoidal, angular, 10–15 mm. thick, dark crimson, slightly villous, becoming glabrous; sepals spreading, persistent; flesh thick, mealy, yellow; nutlets usually 4–5, ridged on the back, 6–7.5 mm. long, nest of nutlets 6–8 mm. thick.— Round-topped shrubs or small trees, sometimes 6 m. high, armed with chestnut-brown curved thorns 2–5 cm. long; vegetative twigs chestnut-brown, glabrous.— Montmorency Falls to Montreal, Que., western New England, and northeastern New York. Type no. 2762 *Eggleston*, Caughnawaga Reservation, Quebec, May 28, Sept. 25, 1902 (in hb. Gray).

Of this species I have examined the following specimens:— PROVINCE OF QUEBEC: Montmorency Falls, May 30, Sept. 23, 1901, *J. G. Jack*, nos. 128, 131 (hb. Arn. Arb.); Longueil, May 27, Sept. 25, 1902, *J. G. Jack*, no. 138 (hb. Arn. Arb.); Mount Royal, Oct. 6, 1903, *Eggleston*, no. 3339 (hb. N. Y. Bot. Gard., hb. Egg.); La Tortue, May 30, Oct. 4, 1900, *W. A. Jack*, no. 68 (hb. Arn. Arb.); Highlands (Island of Montreal), May 30, Sept. 21, 1901, Sept. 26, 1902, *J. G. Jack*, no. 134 (hb. Arn. Arb.); Caughnawaga, May 30, Sept. 24, 1900, *J. G. Jack*, nos. 83, 84 (hb. Arn. Arb.); May 28, Sept. 25, 1902, *Eggleston*, no. 2762 (hb. Gray, hb. N. Y. Bot. Gard., hb. Egg.); Chateaugay, May 31, Sept. 25, 1900, *J. G. Jack*, no. 87 (hb. Arn. Arb); Phillipsburg, July 25, 1901, *E. Brainerd*, no. 28 (hb. Arn. Arb., hb. Egg.). NEW YORK: Crown Point, June 4, Sept. 21, 1902, *Eggleston*, nos. 2703, 3154 (hb. Arn. Arb., hb. Egg.); Sept. 12, 1903, *C. H. Peck*, no. 4 (hb. Arn. Arb.). NEW HAMPSHIRE: North Walpole, May 17, Oct. 4, 1903, *Eggleston*, no. 2923 (hb. Arn. Arb., hb. Egg.). VERMONT: Mr. W. H. Blanchard has collected material in Bellows Falls, which he has referred to this species, but I have not seen it. MASSACHUSETTS: Southborough, May 17, Sept. 4, 1904, *C. S. Sargent*, no. 4 (hb. Arn. Arb.). CONNECTICUT: Giant's Neck, East Lyme, May 3, Aug. 19, Sept. 5, 16, 1904, *C. B. Graves*, no. 70 (hb. Arn. Arb.).

C. PRUINOSA (Wendl.) C. Koch, var. **latisepala** (Ashe), n. comb. *C. latisepala* Ashe, Bull. N. Car. Agric. Coll. **175**: 109 (1900).

C. PRUINOSA (Wendl.) C. Koch, var. **philadelphica** (Sarg.), n. comb. *C. philadelphica* Sarg. Proc. Acad. Sci. Philad. **57**: 588 (Sept. 1905).

C. PRUINOSA (Wendl.) C. Koch, var. **conjuncta** (Sarg.), n. comb. *C. conjuncta* Sarg. Rhod. **5**: 57 (1903).

C. PRUINOSA (Wendl.) C. Koch, var. **Porteri** (Britton), n. comb. *C. Porteri* Britton, Bull. N. Y. Bot. Gard. **1**: 448 (1900).

C. PRUINOSA (Wendl.) C. Koch, forma **dissona** (Sarg.), n. comb. *C. dissona* Sarg. Rhod. **5**: 60 (1903).

C. SILVICOLA Beadle, var. **Beckwithae** (Sarg.), n. comb. *C. Beckwithae* Sarg. Proc. Roch. Acad. Sci. **4**: 124 (1903).

C. BEATA Sarg., var. **compta** (Sarg.), n. comb. *C. compta* Sarg. Proc. Roch. Acad. Sci. **4**: 102 (1903).

C. LEIOPHYLLA Sarg., var. **Maineana** (Sarg.), n. comb. *C. Maineana* Sarg. Proc. Roch. Acad. Sci. **4**: 106 (1903).

C. COCCINIOIDES Ashe, var. **dilatata** (Sarg.), n. comb. *C. dilatata* Sarg. Bot. Gaz. **31**: 9 (1901).

C. PRINGLEI Sarg., var. **exclusa** (Sarg.), n. comb. *C. exclusa* Sarg. Rhod. **5**: 108 (1903).

C. PRINGLEI Sarg., var. **lobulata** (Sarg.), n. comb. *C. lobulata* Sarg. Rhod. **3**: 22 (1901).

C. PEDICILLATA Sarg., var. **Ellwangeriana** (Sarg.), n. comb. *C. Ellwangeriana* Sarg. Bot. Gaz. **33**: 118 (1902).

C. POLITA Sarg., var. **Tatnalliana** (Sarg.), n. comb. *C. Tatnalliana* Sarg. Bot. Gaz. **35**: 106 (1903).

C. MOLLIS (T. & G.) Scheele, var. **sera** (Sarg.), n. comb. *C. sera* Sarg. Bot. Gaz. **33**: 115 (1902).

C. PHAENOPYRUM (L. f.) Medic. Gesch. der Bot. 83 (1793). *Mespilus Phaenopyrum* L. f. Suppl. 254 (1781). *Crataegus cordata* Ait. Hort. Kew. ed. I, **2**: 168 (1789); not *M. cordata* Mill. Dict. ed. VIII, no. 4 (1769) and in Fig. of Plants, 119, t. 179 (1760). This fine species was one of the first American thorns raised in Great Britain, being listed and illustrated by a fine colored plate (t. 13, f. 1) in the Catalogus plantarum...quae in hortis non procul a Londino propagantur (1730). Philip Miller, who was one of the gardeners who prepared this catalogue and was doubtless familiar with this species, tells us in regard to his *Mespilus cordata* of later date, that it was raised in the Chelsea Garden (where he was gardener) in 1738 from seeds which came from America. Furthermore neither his description nor his excellent colored plate of this later species corresponds to *C. Phaenopyrum*, but rather to some form of the *Tenuifoliae*, apparently nearest to *C. macrosperma* Ashe.

C. BRAINERDI Sarg., var. **scabrida** (Sarg.), n. comb. *C. scabrida* Sarg. Rhod. **3**: 29 (1901).

C. BRAINERDI Sarg., var. **Egglestoni** (Sarg.) Robinson in herb., n. comb. *C. Egglestoni* Sarg. Rhod. **3**: 30 (1901).

C. BRAINERDI Sarg., var. **asperifolia** (Sarg.), n. comb. *C. asperifolia* Sarg. Rhod. **3**: 31 (1901).

C. MACRACANTHA Lodd., var. **rhombifolia** (Sarg.), n. comb. *C. rhombifolia* Sarg. Rhod. **5**: 183 (1903).

C. MACRACANTHA Lodd., var. **occidentalis** (Britton), n. comb. *C. occidentalis* Britton, Bull. N. Y. Bot. Gard. **1**: 448 (1900). *C. Colorado* Ashe, Bull. N. C. Exper. Sta. **175**: 110 (1900). *C. coloradensis* Nelson, Proc. Biol. Soc. Wash. **17**: 175 (1904).

C. MACRACANTHA Lodd., var. **succulenta** (Schrad.), n. comb. *C. succulenta* Schrad. ex Link, Handb. **2**: 78 (1831).

C. MACRACANTHA Lodd., var. **neofluvialis** (Ashe), n. comb. *C. neo-fluvialis* Ashe, Jour. Elisha Mitchell Soc. **16**: pt. 2, 71 (1900).

C. CHAPMANI (Beadle) Ashe, var. **Plukenetii**, n. var. *C. tomentosa* of the Linnaean herbarium and of authors, but not of the Linnaean description. *C. leucophleos* Moench, Verz. Ausl. Baeume, 31 (1785)? This thorn was one of the first raised in Great Britain, as is shown by its inclusion in such early works as the above mentioned Catalogus plantarum....quae in hortis non procul a Londino propagantur t. 13, f. 2 (1730) and in Plukenet's Phyt. t. 46, f. 1 (1691).

Of the other two Linnaean species there can be no question, for *C. Crus-galli* L. rests on Kalm's description and is also represented in the British Museum by Clayton's specimen; while *C. viridis* L. is represented in the British Museum by Clayton's specimen (type), though I know of no other specimen of *C. viridis* L. from Virginia. However, there is a specimen of *C. viridis* L. in the U. S. Nat. Herb. (no. 130624) from Chesapeake City, Maryland, *L. F. Ward*. This Ward specimen I referred to *C. Margaretta* Ashe in Torreya **7**: 154 (1907); but a careful study of flowering material for a key has shown my mistaken identification. *C. Margaretta* has two or sometimes three styles, crenately lobed leaves, and numerous spines, while *C. viridis* has four or five styles, acutely lobed leaves, and very few or no spines. *C. viridis*, in flower, is much harder to distinguish from a form of *C. Canbyi* Sarg., namely the one called *C. Pennypackeri* Sarg.; the latter differing from *C. viridis* most obviously in its abundant thorns; and there is a possibility that this Ward specimen is *C. Pennypackeri* without thorns. Our Washington and Baltimore botanists have an excellent opportunity both to investigate this Chesapeake City region, and also Clayton's region about "Windsor" on the Plankatank, for the type location of *C. viridis* L.

Much of my study of the genus *Crataegus* has been done in the herbarium of the New York Botanical Garden, where for some months I have been engaged in bringing together as complete a representation as possible of the group. I have also been greatly aided by facilities afforded me at the Gray Herbarium, and I owe much to the privilege of examining the excellent herbarium and live collections of the Arnold Arboretum. I am further indebted to the Missouri Botanical Garden for the loan of over three thousand sheets of the genus, to the United States National Museum, to the Philadelphia Academy, to Prof. Aven Nelson, to President Ezra Brainerd

for the loan of much additional material, and to a great many botanical friends who have sent me specimens of interest. Mr. C. D. Beadle gave me the privileges of the Biltmore Herbarium and very kindly aided me in the examination of the southern species. Mr. W. W. Ashe most kindly made a three days' trip to allow me to see his *Crataegus* herbarium. I have also to thank Dr. Marshall A. Howe for numerous translations of the descriptions of the older species.

NEW YORK BOTANICAL GARDEN.

NOTES ON SOME PLANTS OF NORTHEASTERN AMERICA.

(*Continued from page 55.*)

M. L. FERNALD.

DENTARIA LACINIATA Muhl., var **integra** (Schulz), n. comb. *Cardamine laciniata* (Muhl.) Wood, var. *integra* Schulz in Engler's Bot. Jahrb. xxxii. 349 (1903).— A rather local extreme, having the leaves strictly ternate; the lateral leaflets entire or slightly toothed, but not cleft. Known only from western New York to Illinois.

GAYLUSSACIA BACCATA (Wang.) C. Koch, forma LEUCOCARPA (Porter) Fernald, RHODORA, x. 53 (1908). My attention has been called by several friends to a clerical error by which, in the original publication of this combination, I credited Wangenheim instead of C. Koch with the publication of *G. baccata*. *G. baccata* (Wang.) C. Koch, Dendrol. ii. pt. 1, 93 (1872) was based upon *Andromeda baccata* Wang., Beitr. Holzger. iii. t. 30, fig. 69 (1787).

TEUCRIUM CANADENSE L., var. **littorale**(Bicknell), n. comb. *T. littorale* Bicknell, Bull. Torr. Bot. Cl. xxviii. 169 (1901).— A lower stiffer and usually more simple plant than the inland *T. canadense*, but clearly passing to it in rich soil. In their most extreme developments the two plants are easily distinguished; the var. *littorale* of coastal beaches having the upper surface of the leaves papillose-roughened beneath the fine appressed pubescence, while the plant of less exposed situations is, as we should expect, thinner-leaved and with less developed papillae.

TEUCRIUM OCCIDENTALE Gray, var. **boreale** (Bicknell), n. comb. *T. boreale* Bicknell, Bull. Torr. Bot. Cl. xxviii. 171 (1901).— The first specimens cited by Dr. Gray under his *T. occidentale*, the Nebraska plants of *Hayden*, "etc." [*H. Engelmann*], have abundant short capitate or stipitate glands amongst the longer somewhat viscid hairs, and represent a species which extends across the continent from Maine to British Columbia and California. An extreme phase of the plant with few or no capitate glands amongst the long hairs of the calyx has a similar range and does not seem specifically separable from *T. occidentale*. This is the plant described by Mr. Bicknell as *T. boreale*. It has been mistaken by Piper, in his Flora of Washington[1] for the true *T. occidentale*, while the typical viscid *T. occidentale* is described by him as a new subspecies *viscidum* Piper, Contrib. U. S. Nat. Herb. xi. 487 (1906).

STACHYS TENUIFOLIA Willd., var. **aspera** (Michx.), n. comb. *S. aspera* Michx. Fl. ii. 5 (1803).— The familiar specific name, *S. aspera*, unfortunately, is antedated by *S. tenuifolia* Willd. Sp. iii. 100 (1801), which must be taken up for the species. *S. tenuifolia* is the smoother phase of the plant, which has been passing as *S. aspera*, var. *glabra* Gray, Syn. Fl. ii. pt. 1, 387 (1878).

STACHYS PALUSTRIS L., var. **homotricha**, n. var., caule retrorso-hirsuto, pilis longis subuniformibus.— Sides and angles of the stems almost uniformly hirsute with long retrorse hairs; otherwise like the typical form.— A frequent plant from eastern New Brunswick to Connecticut and central New York, thence westward to the Pacific. Type collected by the writer on a sandy esker at Brownville, MAINE, September 20, 1900. In typical *S. palustris* the angles of the stem are hirsute with spreading or reflexed hairs, but the sides of the stem are finely appressed-pubescent.

SATUREJA **glabra** (Nutt.), n. comb. *Hedeoma glabra* Nutt. Gen. i. 16 (1818). *H. arkansana* Nutt. Trans. Am. Phil. Soc., n. s., v. 186 (1834). *Calamintha Nuttallii* Benth. in DC. Prodr. xii. 230 (1848). *Calamintha glabella*, var. *Nuttallii* Gray, Man. ed. 2, 307 (1856). *Clinopodium glabrum* Ktze., Rev. Gen. 515 (1891). *Satureja arkansana* Briq. in Engl. & Prantl, Pflanzenf. iv. Ab. 3, 302 (1896).— The writer follows Briquet in considering *Calamintha* Lam. inseparable generically from the older *Satureja* L.

[1] Contrib. U. S. Nat. Herb. xi. (1906).

PYCNANTHEMUM **pycnanthemoides** (Leavenw.), n. comb. *Tullia pycnanthemoides* Leavenw., Am. Jour. Sci. xx. 343, pl. 5 (1831). *Pycnanthemum Tullia* Benth. Lab. Gen. et Sp. 328 (1834). *Koellia pycnanthemodes* Ktze. Rev. Gen. ii. 520 (1891).— By vote of the Vienna Congress the long established name *Pycnanthemum* Michx. (1803) is retained for this genus instead of the earlier but long overlooked *Koellia* Moench (1794).

MENTHA ARVENSIS L., var. **glabrata** (Benth.), n. comb. *M. canadensis*, var. *glabrata* Benth. Lab. Gen. et Sp. 181 (1833). *M. arvensis*, var. *Penardi* Briq. Bull. Herb. Boiss. iii. 215 (1895).— As already indicated by Briquet, *Mentha arvensis* L. and *M. canadensis* L. are confluent, and the latter American extreme is treated as a narrow-leaved variety of the more broadly distributed *M. arvensis*. The var. *glabrata*, common across Canada, and locally southward into New England and Pennsylvania, and along the Rocky Mts., is generally well marked by its less branched smoother stem and smoother leaves, but it clearly intergrades with the other varieties of the species.

GERARDIA PEDICULARIA L., var. **ambigens**, n. var., caule supra glanduloso-villoso; pedicellis calycibusque plerumque villosis.— Stem glandular-villous above; pedicels and calyx usually villous.— Wisconsin to North Carolina and Missouri. Type collected at St. Croix Falls, WISCONSIN, August 20, 1900 (*C. F. Baker*). Transitional between the typical *G. pedicularia*, with the stems puberulent above, and the more southern var. *pectinata* Nutt. Gen. ii. 48 (1818), which has the stems very villous and the calyx glandular-hispid.

VIBURNUM LENTAGO L., var. **sphaerocarpum** Gray, n. var. in herb., drupis sphaeroideis 7–9 mm. diametro.— Drupes spherical, 7–9 mm. in diameter.— The original specimens thus labeled by Dr. Gray were collected in NORTH DAKOTA, at Fort Abraham Lincoln, by *Dr. V. Havard*; but other material has accumulated which shows this small- and globose-fruited extreme to occur from New England to Wyoming.

EUPATORIUM PURPUREUM L., var. **foliosum**, n. var., inflorescentia late corymbosa foliis bracteisque breviore.— Inflorescence broadly corymbose as in var. *maculatum*, but overtopped by the very long upper leaves and bracts.— The characteristic form of the species from western Newfoundland and the Gaspé Peninsula to northern Maine, extending westward to northern Michigan and Iowa. Type collected by the writer in a river-thicket at Van Buren, MAINE, September 18, 1900.

EUPATORIUM URTICAEFOLIUM Reichard, var. **villicaule**, n. var., caule petiolisque sordido-villosis.— Stem and petioles sordid-villous; otherwise as in the typical form.— VIRGINIA, Bedford Co., 1871 (*A. H. Curtiss*).

SOLIDAGO PETIOLARIS Ait., var. **Wardii** (Britton), n. comb. *S. Wardii* Britton, Man. 935 (1901). — Differing from *S. petiolaris* only in the firmer more glutinous and therefore more lustrous foliage.

SOLIDAGO HISPIDA Muhl., var. **lanata** (Hook.), n. comb. *S. lanata* Hook. Fl. Bor.-Am. ii. 4 (1834). *S. bicolor*, var. *lanata* Gray, Proc. Am. Acad. xvii. 190 (1882).— Plants from the banks of the Little Cascapedia and Grand Cascapedia Rivers, and other portions of the Gaspé Peninsula, Quebec, are identical with the original material collected by Drummond on the Plains of the Saskatchewan.

SOLIDAGO **calcicola** (Fernald), n. comb. *S. Virgaurea*, var. *calcicola* Fernald, RHODORA, i. 190 (1899).— Recent detailed studies of types and authentic specimens of this group have convinced the writer that we have in eastern America no plant which can satisfactorily be placed with the Eurasian *S. Virgaurea*. The nearest American ally of that species, as understood by the writer, is *S. macrophylla* Pursh, which, however, is distinct in its longer involucre, etc. *S. calcicola* also simulates forms of *S. Virgaurea* but is quickly distinguished by its firmer more herbaceous bracts and much shorter achenes (only 1–2 mm. long). Its range is now extended from the northeastern border of Maine to the limestone mountains of Gaspé Co., Quebec.

SOLIDAGO **Cutleri**, n. nom. *S. Virgaurea*, var. *alpina* Bigelow, Fl. Bost. ed. 2, 307 (1824). *S. alpestris* Porter, Bull. Torr. Bot. Cl. xx. 210 (1893) and other Am. authors, not Waldst. & Kit. in Willd. Sp. iii. 2065 (1804).— The late Dr. Porter considered this plant identical with the Old World *S. alpestris*; but that species as shown by many European specimens, as well as Waldstein & Kitaibel's own beautiful plate (Ic. t. 208), is very unlike the alpine plant of Bigelow. In fact, it is superficially very similar to the dwarfed alpine variety *thyrsoidea*[1] of *S. macrophylla*, having thinnish leaves with the closely sharp-serrate elliptic or ovate blades rather abruptly narrowed to the slender petiole; and its involucral bracts are thin and linear-attenuate. *S. Cutleri*,[2] on the other hand, has the thick obovate

[1] RHODORA, viii. 228 (1906).

[2] Since the name *Solidago alpina* has been twice used and there is already a *S. Bigelovii*, it is appropriate that our alpine Goldenrod should bear the name of the distinguished New England botanist and pioneer explorer of the White Mountains, MANASSEH CUTLER.

to oblanceolate leaves crenate or serrate chiefly above the middle and tapering gradually to a broad-winged base; and its subherbaceous obtuse or merely acutish bracts are oblong or lanceolate. From other American plants of the *Virgaurea* group, *S. Cutleri* is quickly distinguished by its 30–50-flowered broad heads, its few (2–4, rarely 5) large cauline leaves, and its long (3–3.5 mm.) hirsute achenes. It is confined apparently to the most alpine districts of New England and New York, being known to the writer only from the following mountains. MAINE, Mt. Katahdin; Mt. Bigelow, altitude 1150 m.: NEW HAMPSHIRE, alpine regions of Mts. Adams, Washington, and Monroe; summit of Mt. Lafayette: VERMONT, Chin of Mt. Mansfield: NEW YORK, summit of Mt. Whiteface.— Reported from other high summits, but from none of the lesser mountains.

SOLIDAGO RANDII (Porter) Britton, var. **monticola** (Porter), n. comb. *S. puberula*, var. *monticola* Porter, Bull. Torr. Bot. Cl. xix. 129 (1892). *S. Virgaurea*, var. *monticola* Porter, Bull. Torr. Bot. Cl. xx. 209 (1893). *S. Virgaurea*, var. *Deanei* Porter, Mem. Torr. Bot. Cl. v. 320 (1894).— *S. Randii* includes a large portion of the material which has passed with us as *S. Virgaurea*. In very exposed situations it passes to the dwarf extreme which has been separated as var. *monticola*, and which is often mistaken needlessly for *S. Cutleri*. In *S. Randii* and its variety the heads are 15–30-flowered, in well developed plants the cauline leaves are much more numerous than in *S. Cutleri*, and the appressed-setulose or glabrate achenes are only 2–2.6 mm. long. As far as observed by the writer *S. Cutleri* and *S. Randii*, var. *monticola* are of quite different altitudinal distribution. As pointed out in the preceding paragraph *S. Cutleri* is a truly alpine species. *S. Randii*, var. *monticola*, on the other hand, is apparently unknown on our highest summits, but occurs on the lesser peaks and slopes of northern New England. Its most elevated stations are on the summits of such mountains as Mt. Willard, New Hampshire (793 m.), Mt. Monadnock, New Hampshire (967 m.), and Mt. Willoughby, Vermont (808 m.); and it descends on the granitic coast of eastern Maine to rocks bordering the sea.

SOLIDAGO HUMILIS Pursh, Fl. 543 (1814). The plant which has long passed as *S. humilis* Pursh or *S. Purshii* Porter has a most unfortunate nomenclatorial history. The plant itself is one of the best marked of our eastern species, characterized by its racemose or thyrsoid inflorescence, with the often glutinous heads frequently on

comparatively elongate pedicels (5–15 or even 25 mm. long). Its stem is exceedingly leafy, the subuniform or very gradually smaller oblanceolate or linear cauline leaves numbering, in well developed plants, 10 to 30 or more and commonly bearing small fascicles of leaves in their axils. Its obscurely ribbed oblanceolate basal leaves are 3–12 cm. long, 5–7 mm. broad. This distinct plant occurs on more or less calcareous cliffs and ledgy shores, from the Aroostook River, New Brunswick, to the Potomac, and locally westward to the sand-hills of Lake Michigan. Dr. Gray, on returning from a study of types of American Goldenrods in European herbaria, identified[1] this plant with Pursh's *S. humilis*; but an examination of Pursh's type, now preserved at the British Museum of Natural History, shows that this conclusion must have been reached through some confusion of data.

As Dr. Gray clearly states the Pursh type was "the Newfoundland plant, in herb. Banks, where Solander indicated the species." [1] A photograph of this original sheet in the Banks herbarium and notes taken by the writer show that there are three individual plants upon it. In the middle of the sheet is a specimen with seven very long leaves, all but the uppermost long-petioled, the middle one more than one third as long as the full height of the plant. The inflorescence is an interrupted more or less wand-like panicle. This specimen, which bears the data (on the reverse side of the sheet) "Newfoundland J. B.," was correctly indicated by a note on the sheet in Dr. Gray's hand as the original of *S. humilis* Pursh. The other two plants on the sheet are clearly of one collection and bear the data, "Amer. Sept. Hudson Bay, Albany Fort, 1781," and are marked by Dr. Gray: "Perhaps is the *S. stricta* Torr. & Gray, Fl. non Ait. A. Gray, 1881." These plants from Hudson Bay are, as identified by Dr. Gray, clearly *S. uliginosa* Nutt. (*S. stricta* Torr. & Gray, not Ait.); but the Newfoundland plant collected by Banks is less obviously that species and may be an uncharacteristic *S. uniligulata* (DC.) Porter. As shown by the manuscript descriptions of the Banks plants preserved at the British Museum, Solander had written a description (p. 321) to cover a Bartram plant from Florida and the Banks plant from Newfoundland. Subsequently, however, Dryander altered the description to include the Hudson Bay specimen but to exclude the Florida plant; and Pursh in his Flora (p. 543) took his description

[1] Gray, Syn. Fl. i. pt. 2, 148 (1884).

of *S. humilis* from the complex description of Solander and Dryander, citing "*Herb. Banks.* mss." From the fact that Solander, in the original manuscript description of *S. humilis*, cited (besides the subsequently discarded Florida plant) only one plant, the Banks specimen from Newfoundland, it is fairly clear that this should stand as the type of Pursh's species. Whether or not it proves on more critical examination to be *S. uniligulata* (which is probable) or *S. uliginosa*, it certainly is not the plant of our river-gorges and cliffs to which the name *S. humilis* has so long been applied.

On account of a supposed earlier *Solidago humilis* accredited to Miller, which, however, was published by Miller as *S. humilius*[1] and which is *S. canadensis* L., Porter rejected the name *S. humilis* Pursh and assigned to the plant which has been passing as Pursh's *S. humilis* the name *S. Purshii*,[2] defining his species merely by the citation of the synonym *S. humilis* Pursh. The name *S. Purshii* Porter is, therefore, strictly synonymous with *S. humilis* Pursh; and since, as above pointed out, the plant which must stand as the type of Pursh's species is *S. uniligulata* or a related species, the names *S. humilis* and *S. Purshii* are equally untenable for the plant of our northeastern river-banks and cliffs. A well known station for the plant specially under discussion is at the Great Falls of the Potomac. The plants from this station long have been and by most botanists still are considered conspecific with those from the ledges of the Aroostook, Kennebec, Winooski (or Onion) and Susquehanna Rivers; but by Professor E. L. Greene they have been separated on supposed characters of the inflorescence, involucre, and achenes as *S. racemosa*.[3] The characters upon which Professor Greene relies for the separation all fail when tested by comparison with more northern specimens; and the range assigned by him on a succeeding page ("that plant of the East Canadian coast and islands which is typical *S. humilis*, Pursh, now received under the more safe name of *S. Purshii*, Porter" [4]) suggests that his segregation of *S. racemosa* from the plant of our river-gorges and cliffs, which is known from only a single "East Canadian" station [5] and from no coastal or island stations, was accomplished without a precise understanding of the northern "*S.*

[1] Mill Dict. ed. viii. no. 16 (1768). [2] Porter, Bull. Torr. Bot. Cl. xxi. 311 (1894).
[3] Greene, Pittonia, iii, 160 (1897). [4] Greene, Pittonia, iii. 162 (1897).
[5] The Gorge of the Aroostook River, less than two miles from the northern Maine border.

humilis." Nevertheless, although proposed by Professor Greene for a plant which he supposed distinct, *S. racemosa* is the first name clearly applied to the plant with racemose inflorescence which has passed as *S. humilis* or *S. Purshii*.

SOLIDAGO RACEMOSA Greene, var. **Gillmani** (Gray), n. comb. *S. humilis*, var. *Gillmani* Gray, Proc. Am. Acad. xvii. 191 (1882). *S. Virgaurea*, var. *Gillmani* Porter, Bull. Torr. Bot. Cl. xx. 209 (1893). This splendid plant of the Great Lake region has not only the leaf-texture and -outline but the axillary fascicles, the elongate pedicels, and the involucre and achenes of *S. racemosa*, and seems to differ only in its great size and in the tendency of the lower leaves to have longer and sharper teeth.

SOLIDAGO RUGOSA Mill., var. **villosa** (Pursh), n. comb. *S. villosa* Pursh, Fl. ii. 537 (1814). The material in the Banks herbarium upon which Pursh based his species represents a beautifully marked extreme of *S. rugosa* in which the panicle is elongate and most of the racemes nearly equaled or exceeded by the large subtending leaves. It is the common tendency of the species in western Newfoundland, southern Labrador, and the lower St. Lawrence region, extending into northern Maine.

SOLIDAGO ALTISSIMA L. Sp. 878 (1753). As stated by Dr. Gray, "the true original of the Linnaean species is the 'Virga aurea altissima serotina, panicula speciosa patula, Mart. Cent. 14, t. 14.'" [1] This plate [2] is remarkably characteristic and represents a plant which was taken by Dr. Gray as "a large form of *S. Canadensis*." In fact, Linnaeus compares it with *S. canadensis* in the following words: "Habitus *praecedenti* [*S. canadensis*] *simillimus, diversus magnitudine, tempore florendi, serraturis nervisque foliorum*," etc.,[3] thus showing a clearer conception of the two plants, *S. canadensis* and *S. altissima*, than have most subsequent authors. *S. canadensis*, as interpreted by Dr. Gray, apparently with good reason, is the small-headed plant which has subsequently been described as *S. canadensis*, var. *glabrata* Porter, Bull. Torr. Bot. Cl. xxi. 310 (1894). Dr. Porter, in describing the northern plant as var. *glabrata*, separated it from the commoner plant southward on account of its smoother stem, linear-lanceolate sharp-serrate smoothish leaves, and especially its smaller panicles and involucres; characters which in the main agree with the Linnaean

[1] Gray, Proc. Am. Acad. xvii. 177 (1882).
[2] Martyn, Hist. Pl. 14, t. 14, (1728).
[3] L. Sp. 878 (1753).

description of *S. canadensis*, which was originally said to have the heads smaller than in the subentire-leaved *S. altissima* and which was characterized "foliis trinerviis subserratis."

A detailed study of the small-headed northern plant, which was considered by Dr. Porter a variety of *S. canadensis* but which is the *S. canadensis* of the old European gardens and herbaria and very evidently of Linnaeus, and the larger-headed more southern plant, which was described by Linnaeus as *S. altissima* and has subsequently passed as a large variation of *S. canadensis* (var. *scabra* Torr. & Gray and much which has passed as var. *procera* Torr. & Gray) has convinced the writer that they are perfectly good species and that they are separated by several other characters besides those originally emphasized by Linnaeus. *S. canadensis* has the stem glabrous at least below, though often minutely pubescent above; in *S. altissima* the stem is cinereous-puberulent. In *S. canadensis* the leaves are thin, narrowly lanceolate, glabrous above, minutely pubescent on the nerves beneath, and mostly sharp-serrate; in *S. altissima* the thickish leaves are lanceolate, minutely pubescent or scabrous above, short-pilose beneath, and subentire or only slightly toothed. The involucre of *S. canadensis* is 2–2.8 mm. long, of thin greenish-straw-colored mostly attenuate bracts; that of *S. altissima* 3.2–4.5 mm. long, with more herbaceous and coarser bracts. *S. canadensis*, which abounds from Newfoundland and the lower St. Lawrence to North Dakota, extending southward throughout northern and eastern New England and along the mountains to West Virginia and Kentucky, is in the height of bloom from July to September; *S. altissima* occurs from eastern Massachusetts and Vermont to Michigan and Kansas, extending south to the Gulf of Mexico, and flowers from August to October.

SOLIDAGO ALTISSIMA L., var. **procera** (Ait.), n. comb. *S. procera* Ait. Hort. Kew. iii. 211 (1789). *S. canadensis*, var. *procera* Torr. & Gray, Fl. ii. 224 (1841).

SOLIDAGO GRAMINIFOLIA (L.) Salisb., var. **Nuttallii** (Greene), n. comb. *Euthamia Nuttallii* Greene, Pittonia, v. 73 (1902).— *S. graminifolia* is the common glabrous or nearly glabrous plant of eastern Canada and the northern states, but it passes very frequently to the var. *Nuttallii*, which has the leaves more pubescent and the branches of the inflorescence hirtellous. As originally defined by Professor Greene the more pubescent plant was assigned a known range from

New Jersey and Pennsylvania to Virginia. Material in the Gray Herbarium shows it to extend northeastward to Nova Scotia and west to Michigan.

SOLIDAGO **polycephala**, n. nom. *Euthamia floribunda* Greene. Pittonia, v. 74 (1902), not *S. floribunda* Phil. Anal. Univ. Chil. lxxxvii. 430 (1894).— This pretty species is quickly distinguished from *S. graminifolia*, var. *Nuttallii* by its tiny involucre (3–3.5 mm. long), with very conspicuous appressed deltoid green tips to the bracts. It was originally described from southern New Jersey but the writer has examined characteristic material from adjacent Pennsylvania.

SOLIDAGO **minor** (Michx.), n. comb. *S. lanceolata*, var. *minor* Michx. Fl. ii. 116 (1803). *S. tenuifolia* Pursh, Fl. ii. 540 (1814) in part. *Euthamia minor* Greene, Pittonia, v. 78 (1902).— Distinguished from *S. tenuifolia* Pursh, which has the flat leaves 2–6 mm. wide and the campanulate involucre 2–3 mm. broad, by its almost acicular leaves (the middle cauline 1–1.5 mm. wide) and its nearly cylindric acute-based involucre only 1–1.5 mm. broad. Best developed from Virginia to Florida and Alabama, but said by Professor Greene to reach Connecticut.

SOLIDAGO (EUTHAMIA) **Moseleyi**, n. sp., caule glabro 5–6 dm. alto fastigiatim ramoso, ramulis scabris; foliis linearibus vel linearilanceolatis apice attenuatis 2–3 mm. latis 1-nerviis minute punctatis, foliis ramorum minoribus, ramulorum minutis subulatis; capitulis plerumque pedicellatis, pedicellis scabris; involucro snbcylindrico 3–4 mm. longo 1.5–2 mm. lato, bracteis linearibus tenuibus valde inequalibus.— Stem glabrous, 5–6 dm. high, fastigiate-branched above the middle; branchlets scabrous: leaves linear or linear-lanceolate, taper-pointed, 2–3 mm. broad, 1-ribbed, minutely punctate; rameal leaves smaller, those of the branchlets reduced to minute subulate bracts: heads mostly on scabrous pedicels: involucre subcylindric (slender-turbinate in drying), 3–4 mm. long, 1.5–2 mm. broad; its very unequal thin bracts linear.— OHIO, Oxford Prairie, Erie Co., September 5, 1898 (*E. L. Moseley*). Resembling *S. tenuifolia* Pursh, but without the axillary fascicles of small leaves which usually characterize that species; the bracts of the branchlets much shorter; the heads less glomerulate; and the involucre much smaller and more slender, with softer bracts, that of *S. tenuifolia* being campanulate, 2–3 mm. thick, with firm oblong bracts.

SOLIDAGO **gymnospermoides** (Greene), n. comb. *Euthamia gym-*

nospermoides Greene, Pittonia, v. 75 (1902).— A well marked species of the lower Mississippi basin, differing from *S. leptocephala* Torr. & Gray in its more copious fastigiate branching; its linear-attenuate strongly glutinous leaves at most 2–3 mm. broad, instead of linear-lanceolate, merely acute, and 4–6 mm. wide; and the involucre extremely viscid.

ASTER **depauperatus** (Porter), n. comb. *A. ericoides*, var. *pusillus* Gray, Syn. Fl. i. pt. 2, 184 (1884). *A. ericoides*, var. *depauperatus* Porter, Mem. Torr. Bot. Cl. v. 323 (1894).— This delicate plant of serpentine barrens of southern Pennsylvania and adjacent West Virginia is readily separated from *A. ericoides* by its very slender stem; its tiny rameal leaves; and especially by the turbinate, not companulate nor hemispherical, involucre only 2–3 mm. broad; and by its much less rigid bracts. In richer soil westward it is represented by

Var. **parviceps** (Burgess), n. comb. *A. ericoides*, var. *parviceps* Burgess in Britton & Brown, Ill. Fl. iii. 379 (1898). This is a stouter plant with densely white-villous stems and broader leaves, but with the heads as in the typical form of *A. depauperatus* or slightly larger. It occurs on prairies or in woods of Illinois and Missouri.

ASTER LATERIFLORUS (L.) Britton, var. **bifrons** (Gray), n. comb. *A. diffusus*, var. *bifrons* Gray, Syn. Fl. i. pt. 2, 187 (1884). *A. lateriflorus*, var. *grandis* Porter, Mem. Torr. Bot. Cl. v. 324 (1894).

GNAPHALIUM POLYCEPHALUM Michx., var. **Helleri** (Britton), n. comb. *G. Helleri* Britton, Bull. Torr. Bot. Cl. xx. 280 (1893).— This seems to differ from *G. polycephalum* only in its glandular-viscid stems and to be, therefore, only of varietal value.

CIRSIUM **iowense** (Pammel), n. comb. *Cnicus iowense* Pammel, Proc. Iowa Acad. Sci. viii. 231 (1901).— *Cnicus* L. Sp. 826 (1753) is now generally accepted as a monotypic genus, its only species being the Blessed Thistle, *Cnicus benedictus* L. By a few recent American botanists our thistles with plumose pappus are united with the Old World genus *Carduus* L., which has the bristles plumeless; but the writer finds himself in agreement with DeCandolle, Bentham and Hooker, Gray, Engler, Hoffmann, and many others in keeping the two apart. The earliest designation of the thistles with plumose pappus is apparently *Cirsium* Hill. Brit. Herbal, 427 (1756).

CIRSIUM UNDULATUM (Nutt.) Spreng., var. **megacephalum** (Gray), n. comb. *Cnicus undulatus*, var. *megacephalus* Gray, Proc. Am. Acad. x. 42 (1874). *Carduus undulatus*, var. *megacephalus* Porter, Mem. Torr. Bot. Cl. v. 345 (1894).

CIRSIUM MUTICUM Michx., var. **subpinnatifidum** (Britton), n. comb. *Carduus muticus*, var. *subpinnatifidus* Britton in Britton & Brown, Ill. Fl. iii. 489 (1898).

CIRSIUM **Hillii** (Canby), n. comb. *Cnicus Hillii* Canby, Gard. & For. iv. 101 (1891). *Carduus Hillii* Porter, Mem. Torr. Bot. Cl. v. 344 (1894).

PRENANTHES ALTISSIMA L., var. **cinnamomea**, n. var., pappo cinnamomeo.— Pappus cinnamon-color; otherwise like the typical form.— Indiana to Missouri and Louisiana. Type collected in rich woods, Monteer, MISSOURI, October 5, 1905 (*Bush*, no. 3534).

GRAY HERBARIUM.

THE ANNUAL BOTANICAL SYMPOSIUM.— The fifth annual symposium will be held at Georgetown, Delaware, July 1–8, 1908. Headquarters will be Hotel Eagle, where rooms may be secured at $1.50 a day. Trips will be made to Lewes, Rehoboth, Chesapeake Bay, Indian River, etc. Those desiring to attend should inform JOSEPH CRAWFORD, 2824 Frankford Ave., Philadelphia, Pa.

JOSSELYN BOTANICAL SOCIETY.— The annual meeting of the Josselyn Botanical Society of Maine will be held at Manset, Mount Desert Island, August 4th to 8th, 1908. A reduced rate of $2.00 per day for board and lodging has been granted by the Stanley House, and reduced railroad fares will be arranged. All who propose attending should communicate at once with O. W. KNIGHT, Chairman of Committee on Arrangements, Bangor, Maine.

LEMNA MINOR and SPARGANIUM EURYCARPUM IN RIMOUSKI COUNTY, QUEBEC.— For several summers Professor J. F. Collins and the writer have visited Bic and the adjacent towns of Rimouski County, Quebec, on account of the great development in that region of bold limestone headlands and ridges, upon which are found an extensive high-northern flora (see RHODORA, ix. 158–172). Bordering the harbor of Bic is a salt marsh, the brackish borders of which likewise support a pronouncedly northern flora: *Catabrosa aquatica* (L.) Beauv., *Poa eminens* J. S. Presl, *Scirpus rufus* (Huds.) Schrad., *Carex norvegica* Willd., *C. glareosa* Wahlenb., *Rumex occidentalis* Watson, etc. In

July last, it was, therefore, a great surprise to find a small slightly brackish pool back of the marsh closely covered with *Lemna minor* L., while near by were luxuriant plants of *Sparganium eurycarpum* Engelm.; two species which are very typical of the coastal region from Nova Scotia and eastern Massachusetts southward and of the Mississippi Basin. These plants which are very local at Bic are not definitely recorded in Macoun's Catalogue from the Province of Quebec, though credited to the vicinity of Ottawa. The nearest stations for the *Lemna* seem to be at Petitcodiac, New Brunswick, about 250 miles to the southeast, and at the head of Lake Champlain, about 330 miles to the southwest. The most northerly stations previously known to the writer for *Sparganium eurycarpum* are at Pictou, Nova Scotia, about 350 miles to the southeast, at Oldtown, Maine, 200 miles or more nearly due south, and on Lake Champlain.— M. L. FERNALD, Gray Herbarium.

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A SYNOPSIS OF THE NEW ENGLAND SPECIES OF MICRASTERIAS.

JOSEPH A. CUSHMAN.

THE genus *Micrasterias* includes some of the largest and most showy of the Desmids. The cells are usually disc-shaped and subcircular in outline, cut into many divisions by more or less radiately arranged incisions. Species are often very common in certain areas, but many of them seem limited to lakes or bodies of water of some size. There are twenty-two species given here for New England and this number is probably fairly complete. There are eighteen species given in the Wests' British Desmids. Two of the British species have not been found as yet in America and a third one while reported from the United States has not been found in New England. On the other hand eight of the species given here have not been found in the British Isles and certain of these seem to be peculiar to America. Some of these eight, such as *M. foliacea*, *M. Nordstedtiana* and *M. muricata* are very different in type from others of the genus. The figures given in Wolle's Desmids of the United States were much conventionalized and therefore it is often hard to say just what Wolle actually saw. The same is true of the reported localities where the identification of the species depended upon Wolle's figures. In this genus however this difficulty is much less than is the case of certain other more difficult genera. As shown by Johnson (Bot. Gaz. 1894) the species of *Micrasterias* are very variable. According to the Wests this variability is much greater in American than in British specimens. However as many of these so called varieties are often seen forming one semicell of a specimen, the other semicell of which is typical, it seems hardly wise to recognize them as good varieties.

Many of the species are represented by mounted slides in my own

collection. In nearly all cases there is a single specimen of the species in a central position and alone on the slide so that it may be easily found. These are referred to by number, e. g. H. C. no. 701, etc. Reference is occasionally made to the slides of the Johnson collection now the property of the Cryptogamic Department of Harvard University. These are referred to as H. J. no. 650, etc. All localities from which specimens have been actually examined by the writer are followed by an exclamation point. In other cases the author's name in parentheses follows the record. Enough of the synonymy is given under each species to refer to the original place of publication and to published figures. Measurements are from New England specimens only, unless otherwise stated. A key is given which will help in the identification of the species.

MICRASTERIAS Agardh, 1827.

Cells usually large, commonly sub-circular or elliptical in outline, deeply constricted; semicells usually five lobed, occasionally three lobed, much compressed; polar lobe broadening distally, frequently with a median notch at the middle of the outer border; lateral lobes usually dichotomously divided; zygospores globose, with stout spines; surface often ornamented, usually with acute granules.

A KEY TO THE NEW ENGLAND SPECIES OF MICRASTERIAS.

A. Polar lobe entire or slightly retuse, lateral lobes of semicells two, transversely placed, generally entire and attenuated to their extremities.
  1. Polar lobe fusiform, end strongly convex.
    1. Polar lobe narrower and smaller than the basal lobes. 1. *M. oscitans.*
    2. Polar lobe nearly as wide as basal lobes and of similar size. 2. *M. laticeps.*
  II. Polar lobe spreading, usually with a retuse end.
    1. Apices of polar lobe bifid, narrower than basal lobes. 3. *M. pinnatifida.*
    2. " " " " acute, nearly as wide as " " 4. *M. arcuata.*

B. Lateral lobes of semicells four, radiately disposed and broadest distally.
  I. Polar lobe entire, lateral lobes barely divided. 5. *M. depauperata.*
  II. " " with a median incision.
    1. Lateral lobes generally much divided, interlobular incisions narrow.
      a. Inter-lobular incisions not deep.
        (1) Depth of polar lobe much less than half the length of the semicell.
          (a) Cell nearly as broad as long, smooth. 6. *M. truncata.*
          (b) " much longer than broad, surface granular. 7. *M. Jenneri.*
        (2) Depth of polar lobe at least half the length of the semicell. 8. *M. conferta.*
      b. Interlobular incisions deep.

(1) Polar lobe prominently exserted. 9. *M. apiculata.*
(2) " " not prominently exserted.
(a) Cell without spines or spinose projections.
10. *M. denticulata.*
(b) " with " " " "
aa. Polar lobe very narrow, sides parallel for most of their length, sinus undulate. 11. *M. sol.*
bb. Polar lobe broader, gradually broadening from the base, sinus not undulate.
* A spine on either side of the terminal notch, interlobular incisions with a row of denticulations. 12. *M. papillifera.*
** No spines close to terminal notch, no surface ornamentation. 13. *M. rotata.*
cc. Polar lobe broad and anvil shaped at apex, angles uncinate.
8a. *M. conferta*, var. *hamata.*

2. Lateral lobes with fewer divisions, interlobular incisions widely open.
a. Polar lobe without processes, lateral lobes unequal, upper one with three, lower with two lobules. 14. *M. Torreyi.*
b. Polar lobe with long processes, lateral lobes typically equal and each with two lobules elongated into processes. 15. *M. radiata.*
c. Polar lobe without long processes, lateral lobes equal but not elongated into processes. 16. *M. crux-melitensis.*

C. Polar lobe with accessory processes one on either side of the lobe asymmetrically, not broadened distally as in B.
I. Lateral lobes each divided, divisions broad and obliquely truncate.
17. *M. americana.*
II. Lateral lobes with only the upper divided or neither, the ends narrowed, not obliquely truncate. 19. *M. mahabuleshwarensis.*

D. Polar lobe divided laterally.
I. Semicell three lobed, sides with a conical projection above the basal lobes. 20. *M. Nordstedtiana.*
II. Semicell five lobed, lobes separated by broadly rounded sinuses.
21. *M. muricata.*

E. Polar lobe with interlocking teeth so that cells are united into filaments, lateral lobes with their divisions arranged parallel to those of the opposite side. 22. *M. foliacea.*

1. MICRASTERIAS OSCITANS Ralfs in Jenner's Flora of Tunbridge Wells, 1845, p. 198; Brit. Desm., 1848, p. 76, pl. 10, fig. 2; Wolle, Desm. U. S., 1884, p. 116, pl. 33, figs. 3, 4; W. & G. S. West, Brit. Desm., 1905, p. 78, pl. 41, figs. 1–4. This species has been reported from New England by three observers; Massachusetts (*Wolle*), Lake Quinsigamond, Worcester (*Stone*), Rhode Island, near Providence (*Bailey*). I have not as yet seen undisputed material from New England. Bailey at least had this species for I have found excellent drawings of the typical form among his notes.

2. MICRASTERIAS LATICEPS Nordst., Desm. Brasil., 1870, p. 220, pl. 2, fig. 14; Wolle, Desm. U. S., 1884, p. 115, pl. 37, figs. 4, 5. *M. incisa* Bail., Micr. obs., 1851, p. 142, pl. 1, fig. 13 (*non Bréb.*). *M. disputata* Wood, Fr. Alg., 1873, p. 142, pl. 13, fig. 4. Cells of medium size, a little broader than long, deeply constricted, semicell three-lobed, polar lobe nearly as wide as the cell, lateral interlobular inci-

sions acute, polar lobe acute at the ends, fusiform, lateral lobes bifid at the tips, cell wall minutely punctate. Length 112–150 μ, breadth 112–198 μ, polar lobe 110–170 μ, isthmus 15–31 μ. Me.: Bog between Orono and Bangor, frequent (*W. West*). N. H.: Pudding Pond, North Conway, rare! Hill's Pond, Alton (*H. C. no. 664*)! Mass.: Lake Quinsigamond, Worcester (*Stone*); Carver's Pond, Bridgewater! Lake Watuppa, Fall River (*H. C. no. 7*)! Plymouth (*H. C. no. 660*)! Westport (*H. C. no. 702*)! Sandwich! Eastham! R. I.: Near Providence (*Bailey*); Newport (*Leidy*); Portsmouth! Nyatt (*H. C. no. 673*)! This species as will be seen by the above list of stations is well distributed. It never seems to be abundant however, scattered specimens being the rule in all material examined.

3. MICRASTERIAS PINNATIFIDA (Kütz.) Ralfs, Brit. Desm., 1848, p. 77, pl. 10, fig. 3; Wolle, Desm. U. S., 1884, p. 116, pl. 37, figs. 7, 8; Johnson, Species of Micrasterias, 1894, p. 58, pl. 6, figs. 5, 6; W. &. G. S. West, Brit. Desm., 1905, p. 80, pl. 41, figs. 7–11, 13. *Euastrum pinnatifidum* Kütz., Phyc. Germ., 1845, p. 134. *Euastrum No. 7*, Bailey, Amer. Bacill., 1841, pl. 3, fig. 29. Cells small, slightly broader than long, deeply constricted, sinus open; semicells three lobed, lateral interlobular incisions deep and broadly rounded; polar lobe narrower than the cell, but spreading, the apices minutely bifid, cell wall minutely punctate. Length 53–65 μ, breadth 62–75 μ, polar lobe 46–55 μ, isthmus 9.5–13 μ. Me.: Orono (*Harvey, W. West*); Scarboro' (*W. West*). N. H.: Intervale! Pudding Pond, North Conway! Hill's Pond, Alton (*H. C. no. 668*)! Mass.: Lake Quinsigamond, Worcester (*Stone*); Medford (*H. C. no. 701*)! Sessaquin Lake, Middleboro (*H. C. no. 652*)! R. I.: Wainskut Pond, North Providence (*Bailey*); Nyatt! This small species is more commonly found in numbers than the preceding species, although perhaps not any more widely distributed as far as New England is concerned. Several varieties have been recorded and described from New England. In abundant material it has been shown that this species in common with others of this genus is very variable within certain limits (Johnson, Bot. Gaz., 1894). Specimens were found in which one semicell was typical, the other being var. *inflata* Wolle. Var. *divisa* West also occurs in a similar manner. A trigonal form from Orono, occurring with the typical form and both var. *inflata* and var. *divisa* was named var. *trigona* by West. Such forms which are evidently montrosities seem hardly worthy of varietal rank. Thus *M. pinnati-*

fida may be seen to be variable in the same lot of material within certain limits.

4. MICRASTERIAS ARCUATA Bailey, Micr. obs., 1851, p. 37, pl. 1, fig. 6; Wolle, Desm. U. S., 1884, p. 117, pl. 38, fig. 5. Mass.: Lake Quinsigamond (*Stone*).

4a. MICRASTERIAS ARCUATA, var. EXPANSA (Bailey) Nordst., Alg. Brasil., 1877, p. 23, fig. II, 5, 6, and b in text. *M. expansa* Bailey, Micr. obs., 1851, p. 37, pl. 1, fig. 7; Wolle, Desm. U. S., 1884, p. 117, pl. 37, fig. 12. Mass.: Lake Quinsigamond, Worcester (*Stone*). These records are all there are for New England.

5. MICRASTERIAS DEPAUPERATA Nordst., var. KITCHELII (Wolle) W. & G. S. West, Some N. Amer. Desm., 1896, p. 239; Cushman, Notes on Micrasterias, 1904, p. 396, fig. 2 in text. *Micrasterias Kitchelii* Wolle, Bull. Torrey Club, 1880, p. 45, pl. 5, fig. M; Desm. U. S., 1884, p. 116, pl. 37, figs. 1–3. Cells of medium size, about as long as broad, deeply constricted, sinus open: semicells barely five lobed, the lateral lobes being divided by a rounded incision of slight depth, polar lobe widely spreading, separated from the lateral lobes by a fairly deep, broadly rounded incision, the width across the distal part of the lateral lobes, slightly less than the entire width of the cell. Extremities of all the lobes bifid. Length 125 μ, breadth 125 μ, polar lobe 75–100 μ. Mass.: Gilder Pond, Mt. Everett, Mount Washington (*Wolle*). Although I collected in Gilder Pond in May 1907 I failed to find this or any other form of *M. depauperata*. Due to the late spring few desmids were present. Wolle's material was collected in August.

5a. MICRASTERIAS DEPAUPERATA Nordst., var. WOLLEI Cushman, Notes on Micrasterias, 1904, p. 396, fig. 3 in text. *M. Kitchelii* Wolle, var., Desm. U. S., 1892, p. 129, pl. 42, fig. 2. *M. depauperata* W. & G. S. West, Some N. A. Desm., 1896, p. 238, pl. 14, fig. 1. Cells larger than in the preceding, somewhat longer than broad, the lateral lobes even less divided by a very shallow sinus, apical lobe narrower, width across the distal portion of the lateral lobes only about three fourths of the whole width of the cell; cell wall punctate. Length 140–155 μ, breadth 130–145 μ, polar lobe 90–100 μ, isthmus 21–27 μ. N. H.: Pudding Pond, North Conway, rare! Mass.: Tewksbury (*Lagerheim*); Lake Watuppa, Fall River, common (*H. C. no. 35*)! This is the only form of *M. depauperata* that I have seen from New England. It seems to be a rare species and in but one of the localities was it at all common.

6. MICRASTERIAS TRUNCATA (Corda) Bréb., in Ralfs, Brit. Desm., 1848, p. 75, pl. 8, fig. 4, pl. 10, fig. 5; Wood, Fr. Alg., 1873, p. 144, pl. 21, fig. 15; Wolle, Desm. U. S., 1884, p. 114, pl. 38, fig. 6; W. & G. S. West, Brit. Desm., 1905, p. 82, pl. 42, figs. 1–8, pl. 45, figs. 5, 6. *Cosmarium truncatum* Corda, Alm. de Carlsbad, 1834, pp. 180, 206, pl. 2, figs. 23, 24. *M. crenata* Bréb., in Ralfs, Brit. Desm., 1848, p. 75, pl. 7, fig. 2, pl. 10, fig. 4; W. & G. S. West, Brit. Desm., 1905, p. 85, pl. 42, figs. 10–13. *Euastrum No. 3* Bailey, Amer. Bacill., 1841, p. 294, pl. 3, fig. 24. Cells small, very slightly longer than broad, medium sinus deep and narrow, polar lobe wide, in general fusiform, lateral angles acuminate or bifid, end of the lobe either broadly rounded or slightly retuse; lateral lobes two on each side separated from the polar lobe by a comparatively deep sinus, slightly open; sinus between the lateral lobes shallow and narrowly open, ultimate lobules variable, usually each lobe with two lobules which may have two projections or none. Length 86–113 μ, breadth 80–110 μ, polar lobe 55–81 μ, isthmus 14–22 μ. Me.: Orono (*Harvey, W. West*); Spencer Pond, East Middlesex (*H. C. no. 629*)! Mud Pond, Township Range! Kittery! Bridgton! N. H.: Hanover (*Edwards*); Intervale! Pudding Pond, North Conway! North Woodstock! Mass.: Amherst (*W. West*); Lake Quinsigamond, Worcester (*Stone*); Tewksbury (*Lagerheim*); Reading! Lake Watuppa, Fall River (*H. C. no. 38*)! Sandwich! Eastham! Chilmark! Squam Pond, Nantucket! R. I.: Wainskut Pond, North Providence (*Bailey*). As various gradations occur between typical *M. truncata* and the form known as *M. crenata* Bréb., it seems best not to use the two names. Especially is this true when in American specimens one finds what would pass for typical *M. crenata* making up one semicell and the other having the retuse polar lobe and the lateral lobes of typical *M. truncata*. Since noting such specimens it has seemed best to place all the forms under *M. truncata*. For purposes of distinguishing between the two extremes, the form with the deeper and more rounded polar lobe and the less deeply incised lateral lobes may be known as *M. truncata* (Corda) Bréb., var. **crenata** (Bréb).

7. MICRASTERIAS JENNERI Ralfs, Brit Desm., 1848, p. 76, pl. 11, fig. 1; Wood, Fr. Alg., 1873, p. 146, pl. 13, fig. 7; W. & G. S. West, Brit. Desm., 1905, p. 86, pl. 42, fig. 14, pl. 43, figs. 1, 2. Me.: Orono (*Harvey*), "with truncata." This is the only New England record for this species. It is worthy of note that W. West does not record it from his material from the same locality.

8. MICRASTERIAS CONFERTA Lund., var. HAMATA Wolle, Bull. Torrey Club, 1883, p. 19, pl. 27, fig. 1; Desm. U. S., 1884, p. 114, pl. 38, figs. 3, 4; W. & G. S. West, Some N. A. Desm., 1896, p. 241, pl. 14, figs. 8, 9; Brit. Desm., 1905, p. 90, pl. 43, figs. 10, 11. Cells of medium size, deeply constricted, with a linear sinus, semicells five lobed, interlobular sinuses narrow except those between the lateral and polar lobes, these being widely gaping, polar lobe cuneate, the distal end broadly extended laterally and the angles uncinate with tooth-like projections and with two pairs of small teeth at either side of the apical notch, lateral lobes twice divided dichotomously by shallow sinuses, cell wall coarsely punctate. Length 106 μ; breadth 100 μ, polar lobe, 43.4 μ, isthmus 12.4 μ. Me.: Spencer Pond, East Middlesex (*H. C. no. 604*)! Mass.: Mt. Everett, Mount Washington (Wolle): Lake Quinsigamond, Worcester (*Stone*).

9. MICRASTERIAS APICULATA (Ehrenb.) Menegh., Synops. Desm., 1840, p. 216; W. & G. S. West, Brit. Desm., 1905, p. 97, pl. 47, figs. 1, 2. *M. fimbriata*, forma *apiculata* Wolle, Desm. U. S., 1884, p. 110, pl. 36, fig. 2. *M. furcata* Wood, Fr. Alg., 1873, p. 144, pl. 13, fig. 5. *Euastrum apiculatum* Ehrenb., Organ. kl. Raum, 1834, p. 245; Infus., 1838, p. 161, pl. 12, fig. II. Cells large, slightly longer than broad, sinus deep, narrowly linear, opening outward; semicells five lobed, polar lobe exserted, sides nearly parallel, except at the distal end which is expanded, angles with a pair of stout diverging spines, on the inner side a stout incurved spine at each side and a smaller spine on either side of the median notch; lateral lobes nearly equal, each dichotomously twice divided, the resulting divisions each with a pair of curved spines, all sinuses narrow except those between the lateral and polar lobes, these opening much more widely; surface of the cell with many minute spines, with four larger ones just above the isthmus in each semicell and arranged in a quadrate manner. Length 240–254 μ, breadth 200–217 μ, polar lobe 42–46 μ, isthmus 31 μ. N. H.: Hill's Pond, Alton (*H. C. no. 666*)! Mass.: Medford! There is considerable variation in the spines of the polar lobe. In some cases they are very large and strongly curved.

9a. MICRASTERIAS APICULATA, subsp. FIMBRIATA (Ralfs) Nordst., Bornh. Desm.,.1888, p. 190; W. & G. S. West, Brit. Desm., 1905, p. 99, pl. 46, fig. 6, pl. 47, figs. 2, 3. *M. fimbriata* Ralfs, Brit. Desm., 1848, p. 71, pl. 8, fig. 2; Wolle Desm. U. S., 1884, p. 109, pl. 36, fig. 1. *M. fimbriata* var. *nuda* Wolle, Bull. Torrey Club, 1880, p. 45; Desm.

U. S., 1884, p. 110, pl. 36, fig. 4. *M. fimbriata*, var. *elephanta* Wolle, l. c. fig. 3. *M. fimbriata*, forma *simplex* Wolle, l. c. fig. 8. *M. subfimbriata* Wolle, l. c. fig. 7. In this variety the surface usually has no ornamentation of spines, the spines on the polar lobe are fewer and smaller and the whole lobe less projecting; the basal lobulations of the lateral lobes often project beyond the others. Length 186–229 μ, breadth 180–205 μ, polar lobe 40–50 μ, isthmus 38 μ. Me.: Pushaw Stream (*Harvey*); Scarboro', frequent (*W. West*). N. H.: Rochester (*Wolle*). Mass.: Amherst (*W. West*); Lake Quinsigamond, Worcester (*Stone*); Carver's Pond, Bridgewater! Lake Watuppa, Fall River (*H. C. no. 15*)! Wolle figured and named many forms of this variable species but they seem to be but variations of the same thing. His forms are included in the above synonymy.

10. MICRASTERIAS DENTICULATA Bréb., Alg. Falaise, 1835, p. 54, pl. 8; Ralfs, Brit. Desm., 1848, p. 70, pl. 7, fig. 1; pl. 8, fig. 1; Wolle, Desm. U. S., 1884, p. 109, pl. 34, figs. 4–8 (*forms*); W. & G. S. West, Brit. Desm., 1905, p. 105, pl. 49, figs. 1–7, pl. 50, figs. 1, 2. Cells large, slightly longer than broad, outline subcircular, deeply constricted, sinus very narrowly linear as are the interlobular ones; semicells five lobed, polar lobe broadening distally, concave at the apex with a median notch, angles rounded, lateral lobes broadly cuneate, dichotomously three times divided, ultimate divisions retuse, without spines; surface without ornamentation. Length 234–410 μ, breadth 195–300 μ, polar lobe 65–76 μ, isthmus 25–42 μ. Me.: Penobscot River at Orono (*Harvey*). N. H.: Hanover (*Edwards*); Intervale! Pudding Pond, North Conway! Mass.: Carver's Pond, Bridgewater! Lake Watuppa, Fall River! R. I.: Wainskut Pond, North Providence (*Bailey*). This is one of the few species without spines on some portion of the cell.

10a. MICRASTERIAS DENTICULATA, var. ANGULOSA (Hantzsch) W. & G. S. West., Alg. N. Ireland, 1902, p. 30; Brit. Desm., 1905, p. 107, pl. 50, figs. 3, 4. *M. angulosa* Hantzsch in Rab. Alg., 1862, no. 1407. *M. denticulata* Wood, Fr. Alg., 1873, p. 145, pl. 13, fig. 6. *M. radiosa*, var. *punctata* West, Desm. Mass., 1889, p. 20, pl. 2, figs. 1, 2. Cells more angular than in the typical form, the widest part of the semicell usually above the base, lateral lobes but twice divided, surface coarsely punctate. Length 245–310 μ, breadth 210–300 μ, polar lobe 68–77.5 μ, isthmus 28 μ. N. H.: North Woodstock! Mass.: Amherst (*W. West*); Lake Watuppa, Fall River (*H. C. no. 34*)! This variety

grows to a very considerable size, its angular form and coarsely punctate surface giving it a very different appearance from the typical form than which it seems to be more rare.

11. MICRASTERIAS SOL (Ehrenb.) Kütz., Spec. Alg., 1849, p. 171; W. & G. S. West, Brit. Desm., 1905, p. 95, pl. 46, figs. 1, 2. *M. radiosa* Ralfs, Brit. Desm., 1848, p. 78, pl. 8, fig. 3; Wolle, Desm. U. S., 1884, p. 109, pl. 31, fig. 2. *Euastrum sol* Ehrenb., Mikr. Leb. Sud. u. N. Amer., 1843, p. 413, pl. 4, fig. 16. Cells large, circular in general outline, very deeply constricted, sinus narrowly open, the sides undulate, semicells five lobed, all the sinuses deep; polar lobe with nearly parallel sides, broadest distally, apex concave with a slight median notch, the outer angles each with two teeth, a single tooth within at either side of the median notch; upper lateral lobes larger than the lower ones and often with more lobules, lower lobes dichotomously twice divided to form four equal lobules, the apices variously toothed; cell wall unornamented. Length 140–220 μ, breadth 125–235 μ, polar lobe 25–34 μ, isthmus 20–25 μ. N. H.: Pudding Pond, North Conway! Hill's Pond, Alton! Mass.: Lake Quinsigamond, Worcester (*Stone*); Reading! Carver's Pond, Bridgewater: R. I.: Near Providence (*Bailey*).

11a. MICRASTERIAS SOL, var. ORNATA Nordst., Point sfor. Skand. Vaxt., 4, 1880, p. 25; W. &. G. S. West, Brit. Desm., 1905, p. 97, pl. 46, figs. 3, 4. *M. radiosa,* var. *ornata* Nordst., Desm. Brasil., 1870, p. 223, pl. 2, fig. 11. *M. radiosa* Wolle, Desm., U. S., 1884, pl. 31, fig. 3. *M. radiosa* var. *Wollei* Cushman, Notes on Micrasterias, 1904, p. 394. Cells similar to those of the typical form but with a row of minute teeth bordering the sinus and the interlobular incisions except on the polar lobe. Length 152 μ, breadth 146 μ, polar lobe 28 μ. Mass.: Chilmark, Marthas Vineyard.

11b. MICRASTERIAS SOL, var. **Swainii** (Hastings) n. comb. *M. Swainii* Hastings, in Wolle, Desm. U. S., 1892, p. 119, pl. 42, fig. 1. *M. radiosa* var. *Swainii* W. & G. S. West, Some N. A. Desm., 1896, p. 240, pl. 13, fig. 30. A variety with the basal lobules of each semicell simple and produced into elongated processes. Length 150–160 μ, breadth 151–164 μ, polar lobe 34 μ, isthmus 11.5–16 μ. N. H.: Rochester (*Hastings*). Mass.: Reading (*H. C. no. 644*)!

12. MICRASTERIAS PAPILLIFERA Bréb., in Ralfs, Brit. Desm., 1848, p. 72, pl. 9, fig. 1; Wolle, Desm. U. S., 1884, p. 109, pl. 32, figs. 8, 9; W. & G. S. West, Brit. Desm., 1905, p. 91, pl. 44, figs. 1,

2, 7; Cushman, Zygosp. Desm., 1905, p. 225, pl. 7, figs. 7, 7a. Cells of medium size, slightly longer than broad, nearly circular in general outline; deeply constricted, sinus linear; semicells five lobed, separated by linear sinuses; polar lobe broadening distally with nearly straight or slightly concave sides, apex concave with a median notch, the lateral angles bifid and a tooth at each side of the median notch; lateral lobes cuneate, about equal in size, divided twice dichotomously, the ultimate divisions emarginate; cell wall with a row of acute granules on either side of the sinus and interlobular incisions. Zygospore subglobose, with strong spines, simple or furcate at the apex. Length 152–155 μ, breadth 135–148 μ, polar lobe 36–43 μ, isthmus 15.5–21 μ. Zygospore: length with spines 103–105 μ, without spines 75 μ, breadth with spines 95 μ, without spines 75 μ. Me.: Orono (*W. West*); Bridgeton! N. H.: Pudding Pond, North Conway! Mass.: Amherst (*W. West*); Lake Quinsigamond, Worcester (*Stone*); Reading (*H. C. no. 734*)! also with zygospores! R. I.: Near Providence (*Bailey*). The zygospores that I have observed had the majority of the spines simple, occasionally a few with the apices once furcate but none as much furcate as in Ralfs' figure. The material from Reading had an abundance of zygospores associated with the empty semicells.

13. MICRASTERIAS ROTATA (Grev.) Ralfs, Ann. Nat. Hist., 1844, p. 259, pl. 6, fig. 1; Brit. Desm., 1848, p. 71, pl. 8, fig. 1a, (b?); Wolle, Desm. U. S., 1884, p. 109, pl. 34, figs. 1, 2; W. & G. S. West, Brit. Desm., 1905, p. 102, pl. 48, figs. 1–6. *Echinella rotata* Grev., in Hooker, Br. Fl., 2, 1833, p. 398. Cells large, slightly longer than broad, general outline broadly elliptical; deeply constricted, sinus narrowly linear; semicell five lobed, polar lobe broadening distally, apex with a median notch, the angles with two spines, lateral lobes unequal, the basal ones smaller, each divided dichotomously three times, the ultimate divisions with spinose angles, interlobular sinuses narrowly linear, those between the lobules broader; no surface ornamentation. Length 242 μ, breadth 226 μ, polar lobe 57 μ, isthmus 29 μ. Me.: Penobscot River, near Orono (*Harvey*); Spencer Pond, East Middlesex (*H. C. no. 614*)! N. H.: Pudding Pond, North Conway! Mass.: Amherst (*W. West*); Lake Quinsigamond, Worcester (*Stone*); Westport (*H. C. no. 739*)! R. I.: Wainskut Pond, North Providence (*Bailey*). This is one of our largest and showiest desmids.

14. MICRASTERIAS TORREYI Bailey, in Ralfs, Brit. Desm., 1848,

p. 210, pl. 35, fig. 5; Wolle, Desm. U. S., 1884, p. 108, pl. 30, figs. 1–8. *M. Pseudotorreyi* Wolle, Bull. Torrey Club, 1883, p. 19, pl. 27, fig. 2; Desm. U. S., 1884, p. 108, pl. 32, fig. 1. Cells large, generally subcircular in outline, deeply constricted, sinus at first narrowly linear then opening outward; semicells five lobed, polar lobe broadening distally, sides concave, end emarginate with or without a median notch, angles acute or with a truncate emargination; lateral lobes unequal, in the more common form, the lower with two, the upper with three lobules, usually concave with acute angles, occasionally the lobules again divided and the interlobular incisions narrower but usually opening widely outward; surface without ornamentation. Length 215–280 μ, breadth 170–310 μ, polar lobe 47–90 μ, isthmus 25–38 μ. N. H.; Pudding Pond, North Conway! Mass.: Mt. Everett, Mount Washington (*Wolle*); Lake Quinsigamond, Worcester (*Stone*); Reading! Randolph! There seems to me no doubt that *M. Pseudotorreyi* Wolle is a synonym of *M. Torreyi.* It is reported only from the localities where *M. Torreyi* is found and in my own material specimens were found which bridge the gap in size, and the form of the lobes is variable in all the specimens I have seen. In some cases specimens were nearly as regular as in Wolle's figure but something must be allowed for the conventionalizing of Wolle's figures.

15. MICRASTERIAS RADIATA Hass., Br. Alg., 1845, p. 386, pl. 90, fig. 2; W. & G. S. West, Brit. Desm., 1905, p. 113, pl. 52, figs. 1–9. *M. melitensis* Ralfs, Ann. Nat. Hist., 1844, p. 260, pl. 6, fig. 2 (*not M. melitensis Menegh. 1840*). *M. furcata* Ralfs, Brit. Desm., 1848, p. 73, pl. 9, fig. 2 (not *M. furcata* Ag. 1827); Wolle, Desm. U. S., 1884, p. 111, pl. 35, figs. 5, 6; Johnson, Bot. Gaz., 1894, p. 58, pl. 6, figs. 8–14. *M. pseudofurcata* Wolle, Bull.Torrey Club, 1881, p. 1, pl. 6, fig. 3; Desm. U. S., 1884, p. 111, pl. 35, fig. 4. *M. furcata* var. *simplex* Wolle, Bull., Torrey Club, 1885, p. 128, pl. 51, figs. 6, 7; Fr. Alg., 1887, p. 40, pl. 59, figs. 6, 7. Cells of medium size, slightly longer than broad; very deeply constricted, sinus widely open, often partly closed by the basal lobules; semicells five lobed, polar lobe with parallel sides below, then widely expanding into diverging elongated processes; apex furcate; lateral lobes usually once divided but very variable, ends furcate, lobules diverging; cell wall unornamented. Length 145–192 μ, breadth 124–160 μ, polar lobe 62–105 μ, isthmus 18–30 μ. Me.: Bog between Orono and Bangor; Scarboro', frequent (*W. West*). Vt.: Johnson! N. H.: Noone's Station! Pudding

Pond, North Conway! Mass.: Lake Quinsigamond, Worcester (*Stone*); Tewksbury! Medford (*H. C. no. 712*)! Wellesley! Carver's Pond, Bridgewater! Lake Watuppa, Fall River! Nokechoke Lake, Westport! Milford Pond, Swansea (*H. C. no. 669*)! R. I.: Worden's Pond, near Providence (*Bailey*); Nyatt (*H. C. no. 636*)! As shown by Johnson this species is very variable, all gradations existing between *var. simplex* Wolle and the typical form, and the two semicells of a single specimen often being considerably different. The angle at which the lateral lobes diverge is also very variable.

15a. MICRASTERIAS RADIATA, var. **dichotoma** (Wolle) n. comb.; *M. dichotoma* Wolle, Bull. Torrey Club, 1884, p. 14; Desm. U. S., 1884, p. 111, pl. 52, fig. 2. Similar to the type but with the lobes much more spreading and drawn out laterally. Length 190–250 μ, breadth 155–200 μ, polar lobe 93–111 μ, isthmus 13–18 μ. Mass.: Lake Quinsigamond, Worcester (*Stone*); Tewksbury (*Lagerheim*); Nokechoke Lake, Westport (*H. C. no. 645*)! This seems best considered a variety of *M. radiata* as it differs in but minor characters, the drawn out condition of the lobes being the main thing that distinguishes it.

16. MICRASTERIAS CRUX-MELITENSIS (Ehrenb.) Hass., Br. Alg., 1845, p. 386, pl. 90, fig. 7; Ralfs, Brit. Desm., 1848, p. 73, pl. 9, fig. 3; Wolle, Desm. U. S., 1884, p. 111, pl. 35, fig. 3; W. & G. S. West, Brit. Desm., 1905, p. 116, pl. 53, figs. 1–3. *Euastrum crux-melitensis* Ehrenb., Entw. d. Inf., 1832, p. 82. Mass.: Lake Quinsigamond, Worcester (*Stone*). This is the only New England record for this species. I have never seen specimens which I could refer to this species.

17. MICRASTERIAS AMERICANA (Ehrenb.) Ralfs, Brit. Desm., 1848, p. xix; Wood, Fr. Alg., 1873, p. 143, pl. 12, fig. 17; Wolle, Desm. U. S., 1884, p. 112, pl. 32, fig. 2; W. & G. S. West, Brit. Desm. 1905, p. 117, pl. 53, figs. 4, 5, pl. 54, figs. 1–3. *M. morsa* Ralfs, Brit. Desm., 1848, p. 74, pl. 10, fig. 1. *Euastrum americanum* Ehrenb. Mikr. Leb. Sud. u. N. Amer., 1843, p. 413, pl. 4, fig. I. 15. *Euastrum No. 4* Bailey, Amer. Bacill., 1841, p. 295, pl. 3, fig. 25. Cells of medium size, slightly longer than broad, deeply constricted, sinus opening outward, semicells five lobed, polar lobe large and broadening distally, apex widely retuse, each angle extended into a broad process, denticulate at the end, from near the base of each of these processes is a shorter similar process, each on the opposite side of the polar lobe;

polar lobe widely separated from the lateral ones, which are scarcely separated from one another by a shallow open sinus, each lobe once divided, the lobules obliquely truncated and denticulate; surface of the cell with scattered denticulate granules, most numerous towards the ends of the lobes, and an irregular group centrally above the isthmus on each semicell. Length 124–158 μ, breadth 105–138 μ, polar lobe 50–75 μ, isthmus 18–28 μ. Me.: Orono (*Harvey*). N. H.: North Woodstock! Mass.: Amherst (*W. West*); Lake Quinsigamond Worcester (*Stone*); Stony Brook, Weston! Misery Island, off Beverly Farms! Medford! Plainville! Pondville! Carver's Pond, Bridgewater! Swansea! Framingham (*H. C. no. 726*)! R. I.: Near Providence (*Bailey*). This species seems to be common in material from southern New England but has been met with very seldom in collections north of Massachusetts. Like other species of this genus it is variable. The polar lobe assumes various forms yet none of them with the exception of the following variety is united with other distinctive characters. The four large granules at the apex of the terminal lobe seem to be lacking more often than they are present and the whole cell is often nearly smooth.

17a. MICRASTERIAS AMERICANA, var. RECTA Wolle, Bull. Torrey Club, 1876, p. 122; 1881, pl. 6, fig. 2; Desm. U. S., 1884, p. 112, pl. 32, fig. 3: W. & G. S. West, Brit. Desm., 1905, p. 119, pl. 54, fig. 4. Extremities of the processes of the polar lobe all very short and rounded, apex of the polar lobe nearly straight, sinuses separating the lateral lobes and lobules reduced and a much more even outline developed than in the type. Length 143 μ, breadth 121 μ, polar lobe 65 μ, isthmus 28 μ. N. H.: North Woodstock! Mass.: Carver's Pond, Bridgewater! Framingham (*H. C. no. 703*)! Pond near Old North Cemetery, Nantucket! There are varying gradations between this variety and the type from which it is difficult to group but as a rule the variety seems to be distinct. It is much less common in New England than the typical form.

18. MICRASTERIAS RINGENS Bailey, var. SERRULATA Wolle, Bull. Torrey Club, 1885, p. 128, pl. 51, fig. 15; Fr. Alg., 1887, p. 41, pl. 59, fig. 15; W. &. G. S. West, Some Desm. U. S., 1898, p. 296. Length 156 μ, breadth 152 μ. N. H.: Laconia (*H. J. no. 650, 679*). Whether this is the same as *M. mahabuleshwarensis* Hobson or not seems to be an open question. Upon examining Johnson's slides nos. 650 and 679 I was unable to find the specimens in condition for critical exami-

nation. This is the only New England record and must rest upon the specimens which Johnson saw. "These forms appear to differ from many specimens of *M. mahabuleshwarensis* that we have seen only in the absence of the additional apical process" (W. & G. S. West 1898, p. 296).

19. MICRASTERIAS MAHABULESHWARENSIS Hobson, Ind. Desm., 1863, pp. 168, 169, text fig.; Wolle, Desm. U. S., 1884, p. 112, pl. 37, fig. 10; Johnson, New and rare Desm. U. S., II, 1895, p. 292; W. &. G. S. West, Brit. Desm., 1905, p. 121. *M. americana*, var. *Hermanniana* Wolle, Desm. U. S., 1884, p. 112, pl. 32, fig. 5. This species resembles *M. americana* but differs in the following points. Cells larger, lower and often the upper lateral lobes undivided, ornamentation consisting of a series of acute denticulations bordering the interlobular sinuses, a central ring of four large granules above the isthmus, and often a single granule just above the isthmus. Length 151–220 μ, breadth 135–190 μ, polar lobe 75–100 μ, isthmus 19–22 μ. N. H.: Meredith, rare (*Johnson*). Mass.: Lake Quinsigamond, Worcester (*Stone*); Carver's Pond, Bridgewater! The measurements are those given by W. & G. S. West, British Desmids. This species is closely related to *M. americana* if it is not a variety of it. It has a more southern distribution and is much more common in material from our southern states. It is rare in New England.

20. MICRASTERIAS NORDSTEDTIANA Wolle, Bull. Torrey Club, 1884, p. 15; Desm. U. S., 1884, p. 113, pl. 52, figs. 3–5; Johnson, Bull. Torrey Club, 1895, p. 292, pl. 239, fig. 14; W. & G. S. West, Some N. A. Desm., 1896, p. 239, pl. 14, fig. 4. Cells somewhat longer than wide, semicells three lobed usually, but developing two rudimentary lateral lobes occasionally; polar lobe spreading, divided laterally to form two arms of unequal length on either side, ends with two or more spines, basal lobes bifurcate, spreading, ends spinose, sinus deep, somewhat gaping, rudimentary lateral lobes varying from a small conical projection to a considerable lobe ending in a pair of spines; surface smooth. Length 134–191 μ, breadth 115–171 μ, isthmus 14–27 μ. N. H.: Meredith, rare (*Johnson*).

21. MICRASTERIAS MURICATA (Bailey) Ralfs, Brit. Desm., 1848, p. 210; Wolle, Desm. U. S., 1884, p. 118, pl. 31, figs. 4–7. *M. muricata*, var. *tumida* W. & G. S. West, Some N. A. Desm., 1896, p. 240, pl. 14, fig. 7. *Euastrum muricatum* Bailey, Castk. Desm., 1846, p. 126, figs. 1, 2 in text. Cells large, semicells divided laterally into

three wide portions, connected by narrowed sections, the interlobular incisions deep but broadly rounded, sinus deep, acute angled, median and apical lobes split laterally, basal one split into three parts, the middle one of the three longest and occasionally bifid, apices of all the lobes minutely toothed, cell wall punctate. Length 160–195 μ, breadth 120–155 μ, polar lobe 120–140 μ, isthmus 21–31 μ. Me.: Spencer Pond, East Middlesex (*H. C. no. 633*)! N. H.: Pudding Pond, North Conway. Rare! Mass.: Lake Quinsigamond, Worcester (*Stone*); Tewksbury (*Lagerheim*); Carver's Pond, Bridgewater! Westport (*H. C. no. 689*)! R. I.: near Providence (*Bailey*).

21a. MICRASTERIAS MURICATA, forma MINOR Cushman, Desm. Flora N. H., 1905, p. 254. A form in which the cells are much smaller than in the typical form of the species. Length 123 μ, breadth 84 μ, polar lobe 84 μ, isthmus 16 μ. N. H.: Intervale!

22. MICRASTERIAS FOLIACEA Bailey, in Ralfs. Brit. Desm., 1848, p. 210, pl. 35, fig. 3; Wolle, Desm. U. S., 1884, p. 118, pl. 38, figs. 10, 11; Johnson, Bot. Gaz., 1894, p. 56, pl. 6, figs. 1–4. Cells small, subquadrate in outline, deeply constricted, sinus narrow, linear throughout its length, semicell five lobed, lateral lobes with their outer margins nearly straight, the two sides of the semicell parallel, the upper of the lateral lobes being elongated and somewhat curved, each lateral lobe divided into two or four lobules, the upper usually with the distal lobule shortest; polar lobe rhomboid, end with a quadrate incision with a broad plate like projection on either side, between which are two teeth at one side and two on the reverse side, the opposite polar lobe exactly reversed, the shape allowing the interlocking of the cells to form long linear series: surface typically smooth. Length 80–96 μ, breadth 80–85 μ, polar lobe 36–38 μ, isthmus 14–15 μ, N. H.: Laconia, scarce (*H. J. no. 665*) Pudding Pond, North Conway, rare! Mass.: Gilder Pond, Mt. Everett, Mount Washington (*Wolle*); Lake Quinsigamond, Worcester, (*Stone*). R. I.: Worden's Pond, near Providence (*Bailey*). Johnson worked out the structure of the polar lobe in this species and his figures give a better idea of the structure than a description. This is one of our most beautiful and most interesting species. Johnson records filaments with over a hundred cells.

22a. MICRASTERIAS FOLIACEA, var. **granulifera** n. var. Like the type but the surface covered with large irregularly disposed granules. Var. membrana granulis magnis inordinatim dispositis. N. H.: Pudding Pond, North Conway!

BOSTON SOCIETY OF NATURAL HISTORY.

SOME PLANTS OF TIVERTON, RHODE ISLAND.

MYRA M. SAMPSON.

IN the months of July and August, 1907, I collected specimens in the southeastern part of Rhode Island on the east bank of the Seaconnet River. This part of the state is isolated from the remainder by the above mentioned arm of Narragansett Bay and is thus more closely associated, in its flora, with the adjoining portions of Massachusetts. The particular areas from which collections were made, midway between Seaconnet Point and Stone Bridge, are known as Fogland and Punkatest Neck. The topography along the coast varies considerably. In some places there are high rocky banks, and in others low sandy and marshy areas. Inland there are meadows and swampy ground.

I have recently studied and arranged this material under the direction of Professor J. Franklin Collins who has verified all determinations. Most of the species have already been recorded as occurring in similar situations in other parts of the state, but there are several which appear as yet unrecorded or recorded from one or two special stations only.

Following is the list of species which are of the most interest. The nomenclature, unless otherwise noted, is that of the sixth edition of Gray's Manual.

Rumex Patientia L. Very common along the roadsides, on the river bank, and in waste places.

Amarantus chlorostachys Willd. Few specimens in salt marshes.

Iris prismatica Pursh. Very common in swampy areas within twenty-five yards of the river bank.

Rosa blanda Ait. Very common in swampy land with the preceding.

Triglochin maritimum L. Few specimens near the high tide mark, and in salt marshes.

So far as the writer can ascertain the preceding species have not been reported from Rhode Island, while the following have been recorded only from the stations mentioned in other parts of the state.

Reseda lutea L. Few specimens in cultivated areas within five yards of the river bank. Previously reported from Providence [Rhodora 1: 47].

Sysrinchium angustifolium Mill. Common in meadow land. Apparently common throughout the state. Reported from Providence [Rhodora **1**: 106].

Cerastium arvense L. Few specimens in cultivated areas. Reported from Cumberland and Providence [Plants of Rhode Island, J. L. Bennett, 1888].

Funkia ovata Spreng. Common in cultivated areas. Reported from Providence [Rhodora **1**: 47].

Sparganium americanum var. *androcladum* (Engelm.) Fernald & Eames [Rhodora **9**: 87]. Common in very swampy ground. Reported from Providence, Cranston, Warwick [Rhodora **1**: 105].

FALL RIVER, MASSACHUSETTS.

THE TYPE LOCALITY OF SPHAGNUM FAXONII.

HARLEY HARRIS BARTLETT.

THE March number of RHODORA contains a translation from Hedwigia of the original description of *Sphagnum Faxonii* Warnst. There only the following meagre information is given as to the origin of the type specimen: "Massachusetts, 16 Sept., 1891, leg. Faxon." Warnstorf has been so kind as to send me part of his type material in order that I might match it with more accurately labeled specimens in the duplicate collection of Faxon *Sphagna* at the Harvard Cryptogamic Herbarium, and thus gain accurate knowledge as to the type locality. Search for plants collected on 16 Sept., 1891, proved successful,— enough were found to prove beyond peradventure that on that date Mr. Faxon collected at Streeter Pond in Lisbon, New Hampshire. Furthermore, on that date he collected no peat moss more closely allied to *Sphagnum cuspidatum* (the nearest affinity of *Sphagnum Faxonii* is with this species) than *Sphagnum recurvum* var. *parvifolium*. It seems necessary to conclude, therefore, that both the locality and date given in Warnstorf's article are incorrect.

An examination of all the *Sphagnum cuspidatum* and allied species in the Faxon collection showed but one number which matched the type material of *Sphagnum Faxonii* sent by Warnstorf, namely no. 1049, collected at Sunken Heath, Mt. Desert Island, Maine, 29 June,

1891, by Mr. Faxon, in company with Mr. Rand. This number agrees with the type not only in structural details, but also in those elusive characters of habit which so often give individuality to all the material of the same collection. In the present case the identification of the Mt. Desert plant as the original source of Warnstorf's type is strongly confirmed by the presence, intermingled with both specimens, of the same hepatic, which has been determined by Prof. Evans as *Lophozia inflata* (Huds.) M. A. Howe. It may be mentioned in passing, although it must be admitted that in view of the small number of botanists who collect hepatics it is at best a doubtful argument in favor of Mt. Desert as the type locality of *Sphagnum Faxonii*, that *Lophozia inflata* has never been reported from Massachusetts.

As a check upon the accuracy of the data accompanying the specimens at the Harvard Cryptogamic Herbarium, Mr. Rand's Mt. Desert herbarium was examined, and, as expected, still more of the characteristic original material of *Sphagnum Faxonii* was found, again intermingled with *Lophozia inflata*. Mr. Rand's herbarium afforded, also, two additional stations for the plant on or near Mt. Desert,—Great Marsh Heath, Sea Wall and Great Cranberry Isle. In two cases the labels gave the habitat as "shallow pools." The local use of the word "Heath" on Mt. Desert is explained in the introduction to Rand and Redfield's "Flora of Mt. Desert Island, Maine." Here will also be found citation of all the specimens now referred to *Sphagnum Faxonii*, catalogued under vars. *plumulosum*, *submersum* and *falcatum* of *Sphagnum cuspidatum*.

To determine the relationship of *Sphagnum Faxonii* with other members of the *Cuspidata*, which occur in the same region, should prove an interesting problem to the bryologists of the Josselyn Botanical Society during their annual meeting at Mt. Desert in August.

CAMBRIDGE, MASS.

SOME ALGAE FROM HUDSON BAY.

WILLIAM ALBERT SETCHELL AND FRANK SHIPLEY COLLINS.

HUDSONS BAY is a large body of salt water lying in the Northern portion of North America, between lat. 51° N. and 64° N. and long. 77° W. and 95° W., and nearly enclosed by land. There have been

no reports of algae having been collected in this bay so far as is known to the writers, and one seeking for information as to the characteristics of the marine flora of this vast expanse, situated as it is, near to the North Atlantic on the one side, yet not entirely separated from the western portion of the American Arctic Ocean on the other, searches in vain. Some years ago, Professor D. C. Eaton, of Yale University, received from George Comer, of the Bark Canton, a few specimens which had been cast ashore on Depot Island in lat. 63° 55′ N. and long. 90° 20′ W. and gave them to one of us (W. A. S.) to be disposed of as might seem best. The other of us (F. S. C.) received from Professor John Macoun, a decidedly more extensive collection made by William Spreadborough for the herbarium of the Canadian Geological Survey, on the western shores of James Bay, somewhere between Cape Henrietta Maria and Moose Factory, and consequently between lat. 51° and 55° N. and about long. 82° W.

Although the number of species in the combined collections is not large and does not contain any specimens of particular interest, yet it seems best to the writers to put on record the species in a simple list, in the interest of promoting a knowledge of the distribution of our American forms.

In all we have 28 species and varieties to record and practically all are well known and circumpolar in their distribution, as may be seen by reference to Kjellman's "Algae of the Arctic Sea." The only real exceptions to circumpolar distribution are probably *Agarum Turneri* and *Delesseria denticulata* var. *rostrata*. The former quite certainly does not occur on the coasts of Northern Europe nor in the Siberian Sea. The latter, up to this time, has been supposed to be restricted to Baffin Bay. *Harveyella mirabilis* and *Actinococcus subcutaneus* are inconspicuous and parasitic species, not very well known as yet, and may probably be found to be circumpolar when our knowledge has been made reasonably complete. Postels and Ruprecht have figured a parasite (?) on *Rhodomela floccosa* from the North Pacific Ocean which may be *Harveyella*, and it is reported from Southern California. *Euthora cristata* is reported from the northern Pacific Ocean, but its place seems to be largely taken by the related species *E. fruticulosa*. *Enteromorpha crinita* is not to be regarded as yet as a strictly circumpolar species, but it occurs in the various temperate seas in both Atlantic and Pacific Oceans.

Algae of Hudson Bay.

Chlorophyceae.

Ulva Lactuca L. James Bay.
Enteromorpha crinita (Roth) J. Ag. James Bay.
Enteromorpha intestinalis f. *cylindracea* J. Ag. James Bay.
Enteromorpha intestinalis f. *clavata* J. Ag. James Bay.

Phaeophyceae.

Chaetopteris plumosa (Lyngb.) Kuetz. James Bay and Depot Island.
Chordaria flagelliformis (Muell.) Ag. James Bay.
Desmarestia aculeata (L.) Lamour. James Bay and Depot Island.
Pylaiella littoralis (L.) Kjellm. James Bay.
Elachista lubrica Rupr. James Bay.
Chorda filum (L.) Lamour. James Bay.
Agarum Turneri P. & R. James Bay and Depot Island.
Fucus edentatus De la Pyl. James Bay.
Fucus evanescens Ag. Depot Island.

Rhodophyceae.

Harveyella mirabilis (Reinsch) R. & S. On *Rhodomela lycopodioides* f. *flagellaris* Kjellm., James Bay.
Ahnfeldtia plicata (Huds.) Fr. James Bay.
Phyllophora Brodiaei f. *pygmaea* Darb.? Depot Island.
Phyllophora Brodiaei var. *interrupta* (Grev.) Rosenv. James Bay.
Actinococcus subcutaneus (Lyngb.) Rosenv. On the preceding, James Bay.
Rhodymenia palmata (L.) Grev. James Bay.
Euthora cristata (L.) J. Ag. Depot Island.
Delesseria sinuosa (G. & W.) Lamour. James Bay.
Delesseria denticulata f. **rostrata** Collins comb. nov. (*Delesseria Montagnei* f. *rostrata* Rosenvinge. James Bay.
Polysiphonia nigrescens (Dillw.) Grev. James Bay.
Rhodomela lycopodioides f. *flagellaris* Kjellm. James Bay.
Rhodomela lycopodioides f. *tenuissima* (Rupr.) Kjellm. James Bay.
Odonthalia dentata f. *angusta* Harvey. Depot Island.
Antithamnion boreale (Gobi) Kjellm. James Bay.
Ptilota pectinata (Gunn.) Kjellm. James Bay and Depot Island.

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ON THE IDENTITY OF RUBUS CANADENSIS.

W. H. Blanchard.

In 1753 Linnæus in his Species Plantarum, page 494, described as follows a *Rubus* to which he gave the specific name *Canadensis*.

6. Rubus foliis digitatis denis quinis ternatisque, caule inermi. Habitat in Canada. Kalm.

Caulis subpurpureus. Foliola lanceolata, utrinque nuda, tenuissima, argute serrata. Bractæ lanceolatæ. Stipulæ lineares, acutæ.

6. Rubus with digitate leaves, in tens, fives, and threes, stem unarmed.

Habitat in Canada. Kalm.

Stem somewhat purple. Leaflets lanceolate, naked on either side, very thin, acutely serrate. Bracts lanceolate. Stipules linear, acute.

For a time authors of American floras included this name evidently not because they knew plants that they referred to such a species, but simply because Linnæus had described it. At length, however, it was used for the common northern edible dewberry. This usage continued till 1898 when Prof. L. H. Bailey, in his Evolution of Our Native Fruits, showed that the *R. Canadensis* of Linnæus was an erect, unarmed, glabrous plant. This he learned by examining the original specimens of Linnæus preserved in London.

There he found two sheets. One of these he has figured on page 383. It has on the new cane five long narrow obovate leaflets, long-pointed at each end and very much like those of *R. setosus* Bigelow. The other specimen, unfortunately, he did not figure, but he obtained a good photograph of it, which he has kindly sent to me. This appears to be identical with a plant common in all the elevated parts of Vermont and New Hampshire and not rare generally in the lower sections.

I have now pretty thoroughly explored both states and write with knowledge obtained from personal observation. Specimens of this Rubus have been widely distributed under the name of *R. Canadensis* by President Ezra Brainerd and Mr. W. W. Eggleston. The leaflets of this second Linnæan specimen on the new cane are also five in number, narrow, the middle one ovate with rounded base, the side ones oval or slightly ovate, and the basal ones oval. The one fruit branch has a rather short but otherwise typical raceme.

Linnæus may have had both specimens before him, when he wrote the above description, but there is positive proof that he had the latter. As Dr. Gray has pointed out in Torrey and Gray's Flora of the United States in his remarks on *R. Canadensis*, this latter specimen has one of its leaves pressed directly on the top of another, a leaflet covering one petiole so that the two leaves would appear to a person with poor eyesight to be one leaf with ten leaflets. Here Linnæus undoubtedly got his idea of ten leaflets. The only ternate leaves on either specimen are on the fruit branches. He could get his description of narrow leaflets, lanceolate bracts, and linear stipules from either specimen or from both of them.

This latter form, the *R. Canadensis* described by President Brainerd in RHODORA (**2**: 23) in 1900, can be found by botanists visiting the White Mountains, where it occurs in great abundance in Pinkham Notch near the entrance to Tuckerman's Ravine on the road from Jackson to Gorham. Those visiting Lake Willoughby will find that though *R. Alleghaniensis* Porter is common at West Burke, it disappears about three miles up toward the lake where *R. Canadensis* has the field to itself.

It has been to me a matter of much interest to know the situation in Canada — that part from which it is to be presumed the specimens of Linnaeus were obtained. Accordingly during the last days of August and throughout September, 1907, I searched for Rubus in Canada. No light was obtained from examinations made during the time of the collections in Montreal and Ottawa, but near the headwaters of the Connecticut River in Vermont, New Hampshire and adjacent Canada *R. Canadensis* was abundant. On a trip from Newport, Vermont, to Quebec I found in sheltered places near large rivers some *R. Alleghaniensis* and also occasionally *R. glandicaulis* Blanchard, but the main high-bush blackberry was *R. Canadensis*, exactly the same form which we have in Vermont.

I found it around Sherbrooke, Richmond and Victoriaville, and some at Lyster, which is twenty miles southwest of Quebec. Beyond Sherbrooke all forms of Rubus except *R. strigosus* Michx. become rather scarce and people are not troubled with "briars." *R. strigosus*, however, I found as far north as I went. Some peculiar blackberries grew a few miles north of the citadel at Quebec but I found none there that I knew.

From Quebec I took a continuous car-ride to Roberval on Lake St. John. At Lake Edward, eighty miles north of Quebec, while the train was waiting for the hunters to get off, I found a blackberry that has considerable resemblance to the specimen of Linnæus figured by Prof. Bailey, but this was the only one I saw in Canada.

It may be of interest to botanists to know, and it was a great surprise to me to find, that on both sides of the railroad as far as one can see, from Rivière à Pierre Junction to Lake St. John, a distance of about one hundred miles, the land has been burned over so often that nothing grows there apparently except "fire-weeds." There is also a border at least thirty miles wide all around the lake that has had a similar fate. A small tract on the lake at Roberval was cleared on the occasion of the first fire and has escaped that baptism, and here I was able to learn something of the flora of this northern region. I expected to see it as Michaux saw it, and but for fires it would be nearly the same. I found no blackberries here.

At Three Rivers good *R. Canadensis* was found and also at Kazabazua, forty miles north of Ottawa, but *R. Alleghaniensis* is evidently the prevailing species of the immediate valleys of the St. Lawrence and Ottawa rivers from Three Rivers to Ottawa. Crossing into New York at Brockville at the foot of the Thousand Islands, I found very good *R. Canadensis* at Oswego on the Oswego River, and also at Rochester, and at McLean about fifteen miles northeast of Ithaca. Going through the Adirondacks I found it abundant at Fulton Chain, scattering at Saranac Lake and at Lake Placid, and quite abundant from North Elba till I began to descend into the Ausable valley in Keene.

There now seems to be no good reason to doubt that the specimen with oval-ovate leaflets which Linnæus certainly used in writing his description should be regarded as the type of the species and that we know the plant; while his specimen with cuneate leaflets was probably a sport or an intergrade, or possibly a form of limited range. Were

plants similar to this cuneate-leaved form abundant and widespread it would be more uncertain, but even in such a case the blunder of the ten leaflets ought to settle the question of which to regard as *R. Canadensis.*

There are other though probably local forms of unarmed, glabrous, high-bush blackberries. *Rubus Millspaughii* Britton is one, as I tried to show in the American Botanist, Nov., 1904, and *R. amabilis* Blanchard (RHODORA, **8**: 173) is another.

R. Canadensis is never absolutely unarmed like *R. triflorus* Richardson. Even in deep shade there are a few small prickles, and in open sun they are often quite noticeable. Neither is the species often perfectly glabrous in every part, as will be seen from the description following.

RUBUS CANADENSIS L., Sp. Pl. 494 (1753). Plants large, erect, pyramidal in outline with stout furrowed stems. Glabrous or slightly pubescent, glandless. Unarmed or with few short prickles. Flowers large and showy on slender pedicels. Leaflets narrow. Fruit rather small, sour, in large, open racemes.

New canes. Stems rather strong, erect, seldom branched, recurved above, 4 to 6 ft. high, 5 to 8 ft. long, dark red, glabrous and glandless, well angled and furrowed. Prickles few, straight, small, nearly or quite wanting in shade, frequently quite noticeable in open sun, very variable; when present a true prickle, rather stout, set perpendicular to the stem and on its angles only. Leaves large, 5 to 8 in. long and wide, 5-foliate, thin, dark green and glabrous on the upper surface, bright green and glabrous or sometimes finely pubescent beneath. Leaflets narrow, long-stalked, taper-pointed, finely and doubly serrate-dentate, the middle one ovate, more than twice as long as wide, rounded at the base; the others oval and narrower in proportion, the side ones slightly rounded at the base and the basal ones cuneate. Petioles and petiolules rather stout, glabrous, nearly unarmed, the petiolule of the middle leaflet on large leaves 1½ inches long, the side ones one-half as long and the basal leaflet short-stalked.

Old canes. Erect as ever, normally pyramidal in outline, the second year's growth consisting of racemes on the upper part of the stem and long, leafy branches resembling new canes below, generally one from each old leaf axil but often two. Axis of long leaf-branches nearly straight, terete, glabrous, generally unarmed. Leaves 3-foliate or some of the outer 5-foliate, resembling those on new canes. Racemes 4 to 7 in. long; axis nearly straight, stout, glabrous or finely pubescent, unarmed; pedicels very slender, set at a great angle to the axis and subtended by small bracts; leaves two or three, of fair size, unifoliate or trifoliate, leaflets generally narrow; flowers 10–15, appearing about the middle of June, large and showy, 1¼ to 1½ in. broad, petals oblong,

two-thirds as wide as long; sepals reflexed. Fruit ripening after the middle of August, generally small, short, as wide as long, short-oblong, commonly rather sour.

Abundant as observed by the writer in the higher parts of Vermont and New Hampshire, and in the southeastern townships of the Province of Quebec, and at least occasional in other parts of Canada; occurring also in New York from Rochester to Lake Champlain.

This species is not entirely confined to the high sections, but is occasional near the Connecticut River especially in light shade. Here it is often slightly pubescent and is earlier than in its higher home, but the large flowers, dark green leaves, red, nearly unarmed stems, narrow leaflets and poor fruit are very noticeable. Pubescence on the under side of the leaves and on the inflorescence marks many plants where it is most at home. Some people call it the "sour blackberry" and where it is the only blackberry to be had, people seem to prefer to go without rather than gather it. Nowhere have I seen it thrive better than near the Town House in Stratton, Vt., and on the old turnpike road in the vicinity of the field now marked by a log-cabin where the famous Whig gathering on "Stratton Mountain" was held in 1840 with Daniel Webster as speaker.

The high blackberry situation in Southeastern Vermont is this: Near the Connecticut River the only high blackberry most people know is the long, aromatic *Rubus nigrobaccus* Bailey, an older name for which is *R. Alleghaniensis* Porter which must now be used. As you go west and get into more elevated sections this becomes scarce and another species *R. pergratus* Blanchard (RHODORA, **8**: 96) often called the "square blackberry" is sought by berry pickers who call *R. Alleghaniensis* the "long blackberry," "sow-teat" and "sheep-teat." As you get into still higher sections this becomes scarce and *R. Canadensis* which has grown more and more plenty as you advanced has the field to itself.

WESTMINSTER, VERMONT.

THE GENUS PILINIA.

F. S. COLLINS.

Plate 77.

In a previous paper[1] the writer noted the occurrence of *Pilinia rimosa* Kütz. in Maine, and made some comparison of the species with the plant known as *Acroblaste Reinschii* Wille. There is nothing to add in regard to the former species, but observations made on forms of *Acroblaste* from various stations indicate that all can best be included under *Pilinia*, with somewhat changed definition, as follows:—

Basal layer of abundantly branched filaments, from which arise erect filaments, simple or branched, sometimes terminating in articulate hairs; chromatophore covering the cell wall; sporangia roundish, ovoid or clavate, terminal or lateral on erect filaments, or sessile on the basal layer, the contents forming numerous biciliate zoospores, which escape through an opening at the summit, development unknown.

With this extension the genus will include six American species, all marine, *P. rimosa* and *P. maritima* occurring also in Europe, the others known only in America; *P. maritima* connecting it with *Chaetophora* and originally placed in that genus by Kjellman; *P. Lunatiae* and *P. minor* at the other end coming close to *Gongrosira*. The following key may be found convenient in distinguishing the species.

KEY TO THE AMERICAN SPECIES OF PILINIA.

1. Filaments often ending in hairs.	*P. maritima.*
1. Hairs not present.	2.
2. Erect filaments short, densely packed.	3.
2. Erect filaments longer, yellowish.	4.
3. Dark green; filaments 8–12 μ diam.; on live shells.	*P. Lunatiae.*
3. Yellowish green; filaments only 2–5 μ diam.; on pebbles.	*P. minor.*
4. Forming a rather firm, spongy coating on woodwork.	*P. rimosa.*
4. Forming a thin, soft coating.	5.
5. On shells, pebbles, etc.; sporangia on erect filaments.	*P. Reinschii.*
5. On woodwork; sporangia on basal layer, rarely lateral on erect filaments.	*P. Morsei.*

[1] Collins, Notes on New England Algae, RHODORA, Vol. V, p. 207, 1903.

The genus *Acroblaste* was founded on material from Buzzards' Bay,[1] but no specific name was given; it was left in the unsatisfactory form *Acroblaste* spec., but with sufficient description and good figures. Wille[2] gave it the name *Acroblaste Reinschii*. There appears to have been no farther report of its occurrence in southern New England, but when a somewhat similar form was found at Revere Beach, Massachusetts, it was identified by the writer with Reinsch's plant, and was distributed under Wille's name as P.B.–A., No. 162. This plant, which was found only on the shells of *Lunatia heros* Adams, differed somewhat from Reinsch's description, but in the absence of any specimens, it was impossible to determine how much variation should be allowed for. Within the last two years the writer has found a plant at Mattapoisett, Wood's Hole and Eastham, all in southern Massachusetts, all agreeing with each other and with Reinsch's description and figures, without any tendency in the direction of the differences shown by the Revere Beach plant. The latter has, moreover, been collected at all seasons of the year, and in no instance did it come any nearer to the southern form. Under these circumstances it seems best to consider it distinct, and to characterize it as follows:—

P. Lunatiae n. sp. *Acroblaste Reinschii* Collins, List, RHODORA, Vol. II, p. 43, 1900, as to northern Massachusetts localities only; Collins, Holden & Setchell, P. B.–A., No. 162, 1896. Filamentis basalaribus mox in stratum subparenchymaticum concretis, cellulis forma ac magnitudine variantibus, rotundatis vel angularibus, ad 15 μ diam.; filamentis erectis 8–12 μ diam., superne incrassatis, plerumque 5–6-cellularibus, rarissime usque ad 10-cellularibus, dense stipatis, ramificatione densa; cellulis ejusdem filamenti variantibus quoad formam et magnitudinem; sporagio e cellula terminali formato, a cellulis ceteris parum diverso; colore viridi intenso.

Basal filaments soon becoming united into a subparenchymatous layer, cells of varying shape and size, roundish or angular, up to 15 μ diam.; erect filaments 8–12 μ diam., increasing in size upward, usually 5–6 cells in length, quite rarely up to 10 cells, densely branched and very compact, cells varying in size and shape in the same filament; terminal cell becoming the sporangium, differing but little from any other cell of the filament; color deep green. On live shells of *Lunatia heros* Adams, Revere Beach, Massachusetts.

[1] Reinsch, Bot. Zeit., Vol. XXXVII, p. 361, Pl. III. A, 1878.
[2] Engler & Prantl, Nat. Pflanzenfam., Algen, p. 97, 1890.

This plant is common on the Lunatia shells at Revere Beach, so much so that in spring and early summer it is the exception to find a live shell free from it, and at all times it is to be found plentifully. It appears to die with the host, for it has never been found on dead shells. Its distribution seems to be very limited, as there is no record of its occurrence except at this one station, though the *Lunatia* is found all along the coast, and the alga has been sought for carefully on the Maine coast and in southern New England. It always occurs on the spire of the shell, which in the genus is quite flat; here it forms a roundish patch, thickest at the centre, the tip of the spire, and has never been known to cover more than a quarter of the surface of the shell. The color is a deep rich green, an unusual color in this genus, where a yellowish color is general. The substance is dense, and it is only by crushing or dissection that the structure can be made out. The basal layer is largely continuous, the filaments showing distinctly only at the edges; the erect filaments are short, stout, and of cells usually quite irregular in shape; they increase in size upward, but rather irregularly, the terminal cell being the largest, with a broad rounded top, but not differing otherwise from any other cell of the filament; the spores escape through an opening in the summit, as in other species. The general appearance is rather that of *Gongrosira* than of *Pilinia*.

P. MINOR Hansgirg in Foslie, Contribution to Knowledge of the Marine Algae of Norway, Tromsö Museums Aarshefter, XIII, p. 146, Pl. II, figs. 17–22, 1890. Stratum thin-coriaceous or almost crustaceous, yellow green, more or less extended. Filaments generally short and little branched. Vegetative cells 3–5 μ wide, 1–2 times as long, end cells rounded; in each cell a parietal band-shaped chromatophore. Prof. N. Wille of Christiana has kindly determined the American plant as belonging to the species of Hansgirg, of whose original description the foregoing is a translation. Our plant, however, seems to be more fully developed, so that a more complete account is now possible. There is little distinction between horizontal and erect filaments; near the substratum there is a densely packed cellular mass, in which it is difficult or impossible to distinguish filamentous structure; above this short filaments are easily made out, but they are not uniformly vertical, and they are quite irregular in size and shape of the cells. The latter may be cylindrical, as little as 2 μ diam., but are usually larger and not much longer than broad, ovoid or even subspherical;

the cells in a filament increase in diameter from the base to the summit, and may reach 6 or 7 μ diam. When the terminal cell changes to a sporangium, the size is still greater; the normal form of a sporangium seems to be pyriform, and the size 20–24 × 10–12 μ, but various irregular forms are common. The distinction between basal and erect filaments is less than in *P. Lunatiae*, but the sporangia are more clearly differentiated. It was found on pebbles on the shore of the "Salt Pond," Eastham, Massachusetts, July, 1907. The pebbles were between high and low tide marks, and when the tide was out were wet with cold fresh water from a spring.

P. Reinschii (Wille) nov. comb. *Acroblaste* spec. Reinsch, Bot. Zeit., Vol. XXXVII, p. 361,. Pl. III. A, 1878; *A. Reinschii* Wille in Engler & Prantl, Nat. Pflanzenfam., Algen, p. 97, 1890; Collins, List, RHODORA, Vol. II, p. 43, 1900, as to southern Massachusetts localities only; not Collins, Holden & Setchell, P. B.-A., No. 162, 1896. In this species the basal layer shows the filamentous character throughout, even when the filaments are laterally united; often they remain practically free. The erect filaments are 5–8 μ. diam., and may reach a length of 400 or 500 μ; they are regularly cylindrical except for a slight constriction at the nodes, or less commonly increase in size very slightly upwards; in either case the terminal sporangium is sharply differentiated from the other cells, ovoid or oblong, 16–18 μ diam. Sometimes the erect filaments are simple, and it is only in such cases that the upper cells are larger than the lower; the difference is slight, in any case. Ordinarily the filaments are more or less freely branched, and of the same size throughout. The sporangia are terminal on the main filament or on longer or shorter branches; in some cases a branch is developed from the cell below a sporangium, pushing the latter to one side, so that it appears to be a lateral growth. The spores escape through a terminal opening in the sporangium, almost as large as its diameter; after their escape the filament may resume its growth, coming up through the persistent empty sporangium. It is not uncommon to find several empty shells at different heights on a long filament. The color is a yellowish, somewhat olivaceous green; Reinsch notes its resemblance to small species of *Ectocarpus*. He found it growing on shells of a species of *Turritella*, which it covers with a dense coating; and also on pebbles, both between tides and in shallow water. The writer has found it on other shells, and also on the claws of the spider crab, *Libinia canali-*

culata Say. It is often mixed with *Microchaete grisea* Thuret, *Calothrix* species, and other small algae.

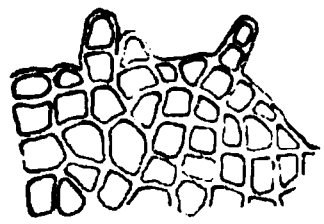
P. RIMOSA Kützing, Phyc. Gen., p. 273, 1843; Collins, RHODORA, Vol. V. p. 207, 1903; Collins, Holden & Setchell, P. B.–A., No. 971, 1902. There is nothing to add to what was given in the writer's note on the first occurrence in America; no other locality has been reported.

P. Morsei n. sp. Filamentis basilaribus irregulariter contortis, plus minusve concretis, cellulis rotundatis, 8–15 μ diam., saepe longitudinaliter divisis, membranam subparenchymaticam bi-polystromaticam formantibus; filamentis erectis ad 2 mm. altis, 7–11 μ diam.; cellulis 1–2 diam. longis, cylindricis vel leviter moniliformibus; sporangiis ovoideis vel pyriformibus, stratum basale insidentibus, sessilibus vel ad pedicellum paucicellulare.

Basal filaments irregularly contorted, more or less united; cells rounded, 8–15 μ diam., often divided longitudinally and forming a subparenchymatous membrane of two or more layers; erect filaments up to 2 mm. high, 7–11 μ diam., cells 1–2 diam. long, cylindrical or slightly moniform; sporangia ovoid or pyriform, on the basal layer, sessile or on a few-celled pedicel. On woodwork, Atlantic City, New Jersey, *Prof. S. R. Morse.*

In this species there seems to be a differentiation between the fertile and the assimilative growths from the basal layer; the former are short, in many cases nothing but the sporangium itself; the latter are longer than in any other species of the genus. After a sporangium is emptied another may be produced by the same filament, but while in *P. Reinschii* the sporangia are at considerable intervals on a long filament, in *P. Morsei* they are "nested," usually only a single cell being produced to support the new sporangium. The cells of the basal filaments divide longitudinally, by a plane approximately parallel to the substratum. The color is yellowish. The writer takes pleasure in giving to this species the name of Prof. Silas Rutillus Morse of the New Jersey State Museum, who first called his attention to it, and to whom we are indebted for much of our knowledge of the algae of the New Jersey coast.

P. MARITIMA (Kjellm.) Rosenvinge, Grønlands Havalger, p. 933, fig. 43, 1893; *Chaetophora maritima* Kjellman, Spetsbergens Alger p. 51, Pl. IV, figs. 15–16, 1877. Frond subspherical, 1–3 mm. diam., with basal layer not strongly developed; erect filaments 6–10 μ diam.,



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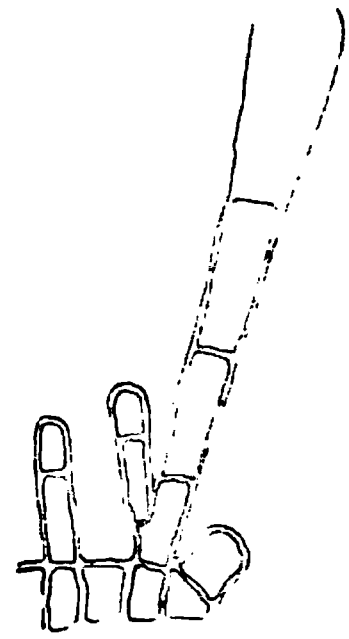

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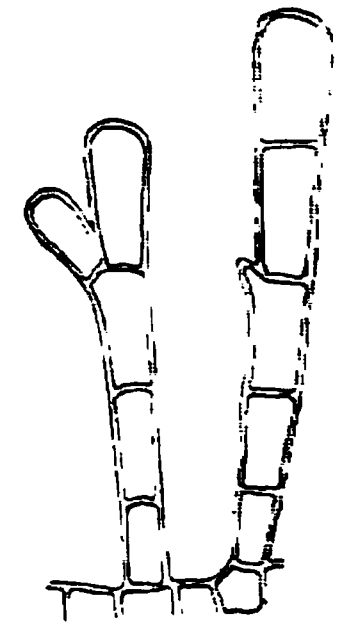

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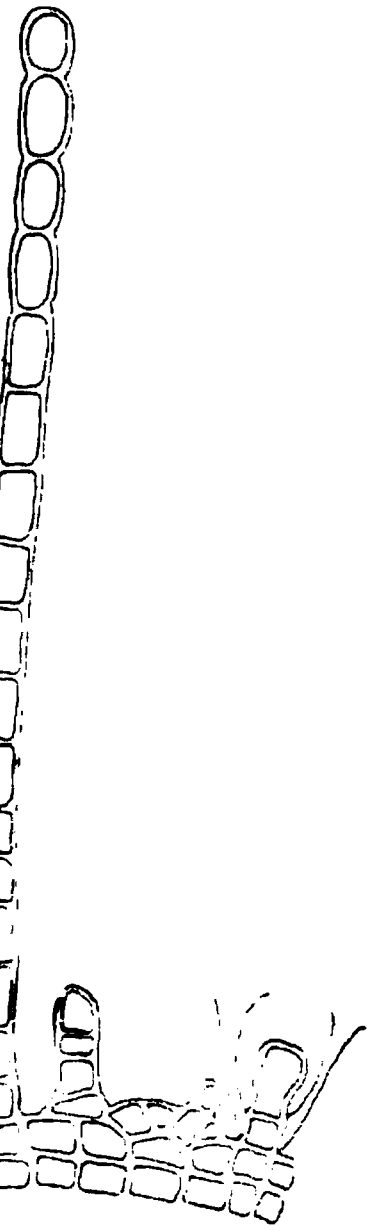

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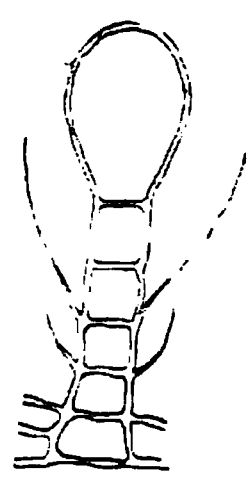
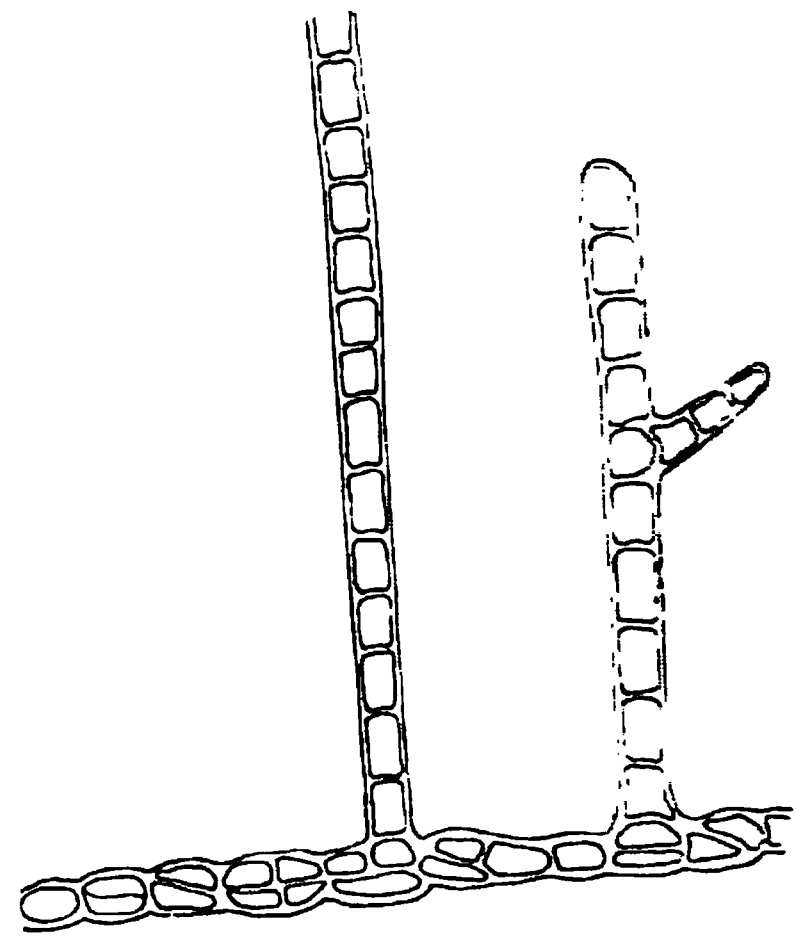


6



4

F. S. Collins ad nat. del.

Figs. 1–3, Pilinia Lunatiae. Figs. 4–6, P. Morsei.

cells about as long as broad, terminating in articulate hairs or ovoid-elliptic cells; sporangia terminal, clavate, 11–12 × 16–21 μ; color green. Greenland.

This species indicates the connection between *Pilinia* and *Chaetophora;* instead of an extended layer it forms roundish gelatinous thalli, forming, with *Calothrix* species, etc., a continuous stratum near high water mark. In 1884 the writer reported[1] its occurrence at Kennebunkport, Maine, but it has not since been seen, and subsequent examination of the material in question failed to show it, so that the report is now unconfirmed by any specimen. There is no reason, however, why it should not be found on the Maine coast, in company with other arctic forms.

MALDEN, MASSACHUSETTS.

EXPLANATION OF PLATE 77.

Fig. 1. *Pilinia Lunatiae*, portion of basal layer.
Fig. 2. " " two erect filaments with branches.
Fig. 3. " " filament with emptied sporangium.
Fig. 4. *P. Morsei*, section of basal layer with cells longitudinally divided, and two erect filaments.
Fig. 5. *P. Morsei*, basal layer more developed, with long and short filaments and new and old sporangia.
Fig. 6. *P. Morsei*, successive sporangia on short filament.

ACHILLEA TOMENTOSA AT WESTFORD, MASSACHUSETTS.— Between 1884 and 1888 I found at Westford, a striking yellow-flowered species of yarrow, since identified as *Achillea tomentosa* L., a native of southern and central Europe. It was in a field with other plants, introduced through the generous use of wool waste as a fertilizer. Some of the *Achillea* was transplanted to a private garden, where it still persists after twenty years, though in the field where it originally grew it has disappeared. As now applied the wool waste is kept until it decomposes sufficiently to kill the weed seeds it so often contains — a procedure more favorable to good agriculture than productive of botanical rarities.— EMILY F. FLETCHER, Westford, Massachusetts.

[1] Bull. Torrey Bot. Club, Vol. XI, p. 130.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT.—III.

IN preparing this list of the *Liliaceae* it has seemed best to the Committee to omit several introduced species that are mentioned in some of our local floras. In most cases this is because no records of existing specimens have been received, while the few definite records that do exist, indicate that such plants are merely persistent and not spreading.

The plants introduced around Concord by the late Minot Pratt have thus been purposely omitted. In fact, only one herbarium specimen of the *Liliaceae* has been reported, and that plant, *Trillium grandiflorum* Salisb., is gradually losing ground. Persons interested are referred to the lists published by the late Alfred W. Hosmer, in RHODORA i, September, 1899. These records of nine years ago, without recent reports, do not seem to the Committee sufficient to entitle any of these species to a place here.

LILIACEAE.

VERATRUM.

V. viride Ait. Wet woods and meadows; very abundant north and west of Boston, but not reported south of the Blue Hills.

UVULARIA.

U. perfoliata L. Leaf-mould soil in open deciduous woods; occasional.

OAKESIA.

O. sessilifolia (L.) Watson. Moist open woods, common.

ALLIUM.

A. tricoccum Ait. Rich woods; Andover, locally abundant; Framingham, rare; Waltham, very abundant in one station.

A. canadense L. Moist open woods and meadows, frequent; not reported south of Needham.

A. VINEALE L. Waste and cultivated ground, a rare weed; Cambridge (Botanic Garden), Milton, Woburn.

A. SCHOENOPRASUM L. Sparingly introduced in Essex county; Georgetown (*Mrs. C. N. S. Horner*).

HEMEROCALLIS.

H. FULVA L. Persistent and spreading around old dwellings; common, but seldom collected.

LILIUM.

L. philadelphicum L. Open woods and fields in rather dry soil; common throughout.

L. canadense L. Meadows, frequent.

L. TIGRINUM Ker. Persistent and spreading about house-sites; occasional.

ERYTHRONIUM.

E. americanum Ker. Moist deciduous woods; common in Essex county, occasional elsewhere.

SCILLA.

S. SIBIRICA Andr. Ballast near Parker St., Cambridge (*M. L. Fernald*, May 16, 1901); damp meadow, station spreading, Concord (*E. F. Williams*).

ORNITHOGALUM.

O. UMBELLATUM L. Moist fields, a frequent escape from gardens.

MUSCARI.

M. BOTRYOIDES (L.) Mill. Essex Co. (*Wm. Oakes*, 1817); in oak woods, Putnamville, Danvers, covering a patch three or four yards square (*J. Robinson*, May 22, 1879); North Andover (*H. C. Sargent & C. H. Morss*, May 1, 1885).

ASPARAGUS.

A. OFFICINALIS L. Fields and roadsides, common.

CLINTONIA.

C. borealis (Ait.) Raf. Rich woods, locally abundant.

SMILACINA.

S. racemosa (L.) Desf. Deciduous woods, very common.
S. stellata (L.) Desf. Sandy soil and wet meadows, occasional.
S. trifolia (L.) Desf. Cold bogs and cedar swamps, rare.

STREPTOPUS.

S. roseus, Michx. Rich woods, Newburyport (*Edward Moulton*, May 20, 1887); Rockport (*Mrs. Ann Babson*, 1866); also near Hospital Point, Beverly (*J. H. Sears*).

MAIANTHEMUM.

M. canadense Desf. Woods, common throughout.

POLYGONATUM.

P. GIGANTEUM Dietr. Escaped, Cambridge (*J. M. Hunnewell*, 1898); roadside, introduced in tall grass, and apparently well established, Woburn (*A. S. Pease & A. H. Moore*).
P. biflorum (Walt.) Ell. Moist deciduous woods, common.

CONVALLARIA.

C. MAJALIS L. Well established in Franklin (*E. F. Williams*) and Watertown (*M. L. Fernald*); also in Danvers and Salem (*J. Robinson*), Wakefield (*F. S. Collins*), Woburn (*A. H. Moore*).

MEDEOLA.

M. virginiana L. Rich deciduous woods, common.

TRILLIUM.

T. erectum L. Rich woods, occasional in Essex county; Milton, "doubtless introduced" (*C. H. Morss*).

T. cernuum L. Damp woods, common throughout.

T. undulatum Willd. (*T. erythrocarpum* Michx.) Rich woods, rare.

ALETRIS.

A. farinosa L. Sandy roadside, common, Bridgewater (*J. A. Cushman*); formerly in Needham, but exterminated in 1885 (*T. O. Fuller*).

SMILAX.

S. herbacea L. Moist fields and open woods; fairly common, but not reported south of the Blue Hills.

S. rotundifolia L. Woods, very common; more luxuriant in moist situations.

S. glauca Walt. Dry thickets and railroad embankments; Dedham, Hanson, Milton, Roxbury, Weston, Westwood.

C. H. Knowlton
J. A. Cushman
Walter Deane
A. K. Harrison
} *Committee on Local Flora.*

NOTE ON WEIGELA ROSEA.

Mary F. Peirce.

There is a small gland at the base of the blossom of *Weigela rosea*. I knew this forty years ago; but had entirely forgotten it, until, in looking over some old letters a short time ago, I discovered one from a pupil of mine, the niece of Dr. Asa Gray. This reads as follows.—

"I showed Uncle Gray the little gland in *Weigela rosea*. He had

not noticed it before and can not account for it. He can not tell why there is but one, or in fact why it should be there at all. I presume that he will look it up and thanks to you, it will appear in the next Botany.

Yours ever,

ALICE A. GRAY.

Botanic Garden,
June 28th 1867."

On making inquiry at the Botanic Garden, Cambridge, a few days ago, I could not find that Dr. Gray had made any record of the study of the point called to his attention. The *Weigela* is a foreign shrub and therefore has not been included in the Flora of this country.

The gland is small, oblong, and green in a fresh blossom. It lies within and at the base of the monopetalous corolla. It is close to the base of the style, but forms no part of it. It seems to secrete a honey-like substance. The style is very lightly attached to the ovary (which lies below the calyx) and is easily separated from it in the attempt to open the blossom. This makes it easy to mistake the gland for the ovary.

Has this been noticed in any magazine or paper, or has any one attempted to explain its use? After forty-one years of waiting, I should be glad to learn something more about it.

WESTON, MASSACHUSETTS.

[In a search, necessarily hurried, we find the following references to the structure in question: 1) Eichler, Blüthendiagramme, i. 267, where it is mentioned as an anteriorly placed glandular outgrowth of the disk, its position being shown in figure 142 E on page 265. 2) Knuth, Handbook of Flower Pollination (J. R. Ainsworth's translation), ii. 525, where under *Weigela* it is stated that the nectar is "secreted by a green swelling between the base of the style and the corolla." The structure has been examined in fresh material and we are inclined to agree with the authors cited, in believing it to be an elevated outgrowth of the disk, modified to secrete nectar and attract insects, which effect cross-pollination.— Ed.]

Vol. 10, No. 114, including pages 97–116, was issued 15 July, 1908.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 10. August, 1908. No. 116.

TWO NEW SPECIES OF ACROCHÆTIUM.

F. S. Collins.

Acrochætium minimum n. sp. Strato basali e filamentis epi-vel endophyticis constituto, ad superficiem vel inter cellulas superficiales plantæ hospitis repentibus, initio liberis, mox plus minus concretis, non autem membranam veram formantibus; cellulis 2–4 μ diam., 1–4 diam. longis, forma valde irregularibus; filamentis basalibus ramos plures breves emittentibus, ultra superficiem plantæ hospitis emergentes, 1–4 cellulares, cellulis 2–3 μ diam., 1½–3 diam. longis, sæpe in sporam pyriformem, indivisam, 5 × 7 μ, desinentes; minus frequenter filamenta longiora, usque ad 25 cellulas, cellulis ad 8 diam. longis, 2–3 μ diam., simplicia, interdum sporam lateralem, sessilem vel ad pedicellum unicellulare affixam, sporæ terminali similem, gerentia.

Basal layer composed of epi- or endophytic filaments, creeping on the surface or among the superficial cells of the host plant, at first free, later more or less united, but not forming a genuine membrane; cells 2–4 μ diam., 1–4 diam. long, of quite irregular form; basal filaments emitting many short branches, extending beyond the surface of the host, 1–4-celled, cells 2–3 μ diam., 1½–3 diam. long, often terminating in an undivided pyriform spore, 5 × 7 μ; less frequently emitting longer filaments, up to 25 cells, cells up to 8 diam. long, 2–3 μ diam., occasionally bearing a lateral spore, sessile or on a unicellular pedicel, similar to the terminal spore. On *Desmarestia viridis* (Fl. Dan.) Lamour., Robinson's Hole, Massachusetts, Aug., 1907. I. F. Lewis.

The dimensions here given are less than those of any hitherto described species of the genus, and the erect part is smaller in proportion to the horizontal, but it seems to be an *Acrochætium*. The filaments of the basal layer wind about the round cortical cells of the *Desmarestia*, but do not seem to penetrate below the outer layer; the cells assume all possible forms, according to the space available for

them. The host was more or less infested, almost to the extreme ends of the young branchlets. The germinating spore appears generally to send out the horizontal filaments at once, but no erect filaments; these arise later from the horizontal layer. When the end of one horizontal filament encounters another filament, it may either attach itself and cease growing, or bend until it is parallel to the other filament, adhering to it laterally. Short erect filaments are abundant, seldom over 25 μ long, normally ending in a pyriform spore; much less common are the long filaments, straight, long-jointed, usually simple and sterile, occasionally with one or two lateral spores, usually sessile, rarely borne on a short cell.

Several other epiphytes were growing on the *Desmarestia*; *Streblonema oligosporum* Strømf., *Acrochætium Daviesii* (Dillw.) Näg., *Erythrotrichia ceramicola* (Lyng.) Aresch., a young *Polysiphonia* and some small, sterile, Peysonnellia-like disks. *Desmarestia viridis* is an abundant plant all along the New England coast, and hardly any abundant species is so generally free from epiphytes; it would be interesting to know what combination of circumstances at this place made it an attractive residence for all these species.

A. Hoytii n. sp. Cellula basali (spora originali) rotundata, 12–25 μ diam., vel verticaliter elongata, tunc ad 30 μ longa, filamenta 1–3 erecta, 6–7 μ diam., emittente, cellulis 2–4 diam. longis; ramificatione subfrequente inferne, superne minus frequente, ramis ultimis prælongis, simplicibus vel subsimplicibus, in setam tenuissimam attenuatis. Sporis lateralibus, oblongis, 6–15 μ, ad pedicellum unicellulare, parte superiore filamenti affixis.

Basal cell (original spore) 12–25 μ diam., spherical or somewhat elongate vertically, then up to 30 μ long; 1–3 filaments arising from each basal cell; main filament about 6 μ diam., cells 2–4 diam. long; branching rather frequent below, rarer above; ultimate branches very long, simple or nearly so, gradually tapering into a hair. Spores lateral on the upper part of the filament and branches, on one-celled pedicels, oblong, 6×15 μ. On *Dictyota dichotoma* (Huds.) Lamour., Beaufort, North Carolina. W. D. Hoyt.

In this species the germinating spore not merely remains distinct through the life of the plant, but increases to several times its original size, and may send up more than one vertical filament. At least this seems to be the only explanation of the appearance presented. The large cell is more or less imbedded in the cortex of the host, but has neither descending nor lateral growth. Among American species it seems nearest related to *A. Dasyæ* Collins, but in the latter the per-

sistent spore increases little if any in size, and has not been observed to produce more than one erect filament. The spores in *A. Dasyæ* are larger and sessile. This plant was received from Mr. Hoyt, who has been making some interesting studies in *Dictyota* at the Beaufort station of the U. S. Bureau of Fisheries, of which some of the results have been published.[1] The type is in the herbarium of the National Museum. For a liberal supply of identical material, to be distributed in the Phycotheca Boreali Americana, the writer is indebted to the authorities of the Bureau of Fisheries.

MALDEN, MASSACHUSETTS.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,— XXI.[2] CYPERACEAE.[3]

M. L. FERNALD.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Cladium mariscoides (Muhl.) Torr.	+	+	+	+	—	+
Cyperus aristatus Rottb.	+	+	+	+	—	+
" dentatus Torr.	+	+	+	+	+	+
" " var. ctenostachys Fernald				+		
" diandrus Torr.	+	+	+	+	+	+
" Engelmanni Steud.				+		
" erythrorhizos Muhl.				+		+
" esculentus L.	+	+	+	+	+	+
" " var. leptostachys Boeckl.					+	+
" ferax Rich.				+	—	+
" filiculmis Vahl.				+	+	+
" " var. macilentus Fernald	+	+	+	+	+	+
" fuscus L.				+		—
" Grayi Torr.				+	—	+

[1] Bot. Gazette, Vol. XLIII, p. 383, 1907.

[2] Printed in RHODORA as supplementary matter.

[3] For the list of *Carices* see RHODORA, iv. 218 (1902).

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Cyperus Houghtonii Torr.			+	+		
" Nuttallii Eddy	+			+	+	+
" ovularis (Michx.) Torr.				+		
" rivularis Kunth	+	+	+	+	+	+
" strigosus L.	+	+	+	+	+	+
" " var. capitatus Boeckl.	+	+	+	+		+
" " var. compositus Britton				+		
" " var. robustior Kunth				+		+
Dulichium arundinaceum (L.) Britton	+	+	+	+	+	+
Eleocharis acicularis (L.) R. & S.	+	+	+	+	+	+
" diandra C. Wright	+	+	+	+		+
" Engelmanni Steud.				+		+
" " var. detonsa Gray				+		
" intermedia (Muhl.) Schultes	+		+	+		+
" interstincta (Vahl) R. & S.				+	+	
" melanocarpa Torr.				+	+	
" obtusa (Willd.) Schultes	+	+	+	+	+	+
" olivacea Torr.	+	−	+	+	+	+
" ovata (Roth) R. & S.	+		+	+		+
" palustris (L.) R. & S.	+	+	+	+	+	+
" " var. calva (Torr.) Gray			+			
" " var. glaucescens (Willd.) Gray	+		+	+		+
" " var. vigens Bailey	+	+	+			+
" quadrangulata (Michx.) R. & S.						+
" Robbinsii Oakes	+	−		+	+	+
" rostellata Torr.		+		+	+	+
" tenuis (Willd.) Schultes	+	+	+	+	+	+
" Torreyana Boeckl.						+
" tuberculosa (Michx.) R. & S.				+	+	+
Eriophorum angustifolium Roth.	+					
" " var. majus Schultz	+					
" callitrix Cham.	+	+	+	+	+	+
" gracile Roth.	+	+	+	+	+	+
" opacum (Björnstr.) Fernald	+			+		
" tenellum Nutt.	+	+	+	+	+	+
" virginicum L.	+	+	+	+	+	+
" " var. album Gray						+
" viridi-carinatum (Engelm.) Fernald	+	+	+	+	+	+
" " var. Fellowsii Fernald	+			+		
Fimbristylis Frankii Steud.	+	+	+	+	+	+
Fuirena squarrosa Michx.				+	−	
Hemicarpha micrantha (Vahl) Britton		+		+	+	+
Kobresia elachycarpa Fernald	+					

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Psilocarya scirpoides Torr.				+	+	
Rynchospora alba (L.) Vahl	+	+	+	+	+	+
" " var. macra Clarke				+		
" capillacea Torr.	+		+			
" " var. leviseta E. J. Hill	+					
" fusca (L.) Ait. f.	+	+	+	+	+	+
" glomerata (L.) Vahl	+	+	+	+	+	+
" macrostachya Torr				+	+	+
" " var. inundata (Oakes) Fernald				+		
" Torreyana Gray		+				
Scirpus americanus Pers	+	−	−	+	+	+
" atrocinctus Fernald	+	+	+	+	+	+
" " var. brachypodus Fernald	+	+	+	+		+
" atrovirens Muhl.	+	+	+	+	−	+
" var. pycnocephalus Fernald	+					
" caespitosus L.	+	+	+			
" campestris Britton, var. Fernaldii (Bicknell) Bartlett.	+			+		
" " var. novae-angliae (Britton) Fernald	+	+		+	−	+
" " var. paludosus (A. Nelson) Fernald	+	+		+	+	+
" Clintonii Gray	+					
" cyperinus (L.) Kunth	+	+	+	+	+	+
" " var. Andrewsii Fernald			+	+		+
" " var. condensatus Fernald	+	+	+	+	+	+
" " var. pelius Fernald	+	+	+	+	+	+
" debilis Pursh	+		+	+	+	+
" " var. Williamsii Fernald				+		
" Eriophorum Michx.						+
" fluviatilis (Torr.) Gray			+	+	−	+
" georgianus Harper	+	+	+	+	+	+
" Hallii Gray				+		
" heterochaetus Chase			+	+		
" hudsonianus (Michx.) Fernald	+	+	+	+	+	+
" lineatus Michx.			+	+		+
" nanus Spreng.	+		−	+	+	−
" occidentalis (Watson) Chase	+		+	+		
" Olneyi Gray		+		+	+	+
" " var. contortus Eames						+
" pauciflorus Lightf.	+		+			
" Peckii Britton		+	+	+		

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Scirpus pedicellatus Fernald	+	+	+	+		+
" " var. pullus Fernald	+	+	+			
" planifolius Muhl.			+	+	+	+
" polyphyllus Vahl				+	−	−
" " var. macrostachys Boeckl.						+
" robustus Pursh				+		
" rubrotinctus Fernald	+	+	+	+		+
" " var. confertus Fernald	+					
" Smithi Gray	+		+		+	+
" " var. setosus Fernald	+			+		
" subterminalis Torr.	+	+	+	+	+	−
" sylvaticus L.	+	+		+	+	+
" " var. Bissellii Fernald						+
" Torreyi Olney	+	+	+	+	+	−
" validus Vahl	+	+	+	+	+	+
Scleria pauciflora Muhl., var. caroliniana (Willd.) Wood				+		+
" reticularis Michx.				+	+	
" " var. pubescens Britton					−	−
" triglomerata Michx.			−	+	−	+
" verticillata Muhl.				−		+
Stenophyllus capillaris (L.) Britton	+	+	+	+	+	+

Notes upon the above List.

Cyperus ferax Rich. As understood by the writer this includes *C. speciosus* Vahl.

C. filiculmis Vahl. All the material examined from northern New England is var. *macilentus* Fernald.

C. ovularis (Michx.) Torr. has been collected on made land about Boston, but is perhaps not persistent.

C. erythrorhizos Muhl., var. *pumilus* Engelm., *Eleocharis diandra* C. Wright, var. *depressa* Fernald, and several other minor variations are purposely omitted from this list as they seem to be only states due to temporary conditions of environment.

Eriophorum angustifolium Roth. This is the plant which was taken by the writer in his former discussion of the genus (Rhodora vii. 88) to be *E. polystachion* L. Messrs. Rendle and Britten have recently shown,[1] however, that the name *E. polystachion* must be

[1] Rendle & Britten, Journ. Bot. XLV, 443 (1907).

restricted to the endemic Eurasian plant which has generally passed as *E. latifolium* Hoppe, and that the more widely distributed boreal species which has been called *E. polystachyon* must be known as *E. angustifolium* Roth.

Fimbristylis Frankii Steud. This is the northern plant which has been passing very generally as *F. autumnalis*. True *F. autumnalis* (L.) R. &. S. is a southern species with more slender spikelets in mostly decompound umbels.

Stenophyllus capillaris (L.) Britton is our representative of a characteristic genus of warm regions. Our plant has recently been known as *Fimbristylis capillaris* (L.) Gray.

Suggestions for Special Observation.

Cyperus cylindricus (Ell.) Britton extends along the coast from Texas to Long Island and may be expected to reach Cape Cod and the adjacent sandy regions.

C. dentatus Torr., var. *ctenostachys* Fernald is a characteristic plant of the pine-barren regions of Cape Cod and New Jersey, and should be sought in Rhode Island and southeastern Connecticut.

C. Engelmanni Steud. and *C. erythrorhizos* Muhl. are both rather abundant in low grounds of the Boston basin. They occur beyond our limits along the coastal plain and in the Mississippi basin, and should be watched for in southern New England.

C. flavescens L. extends along the coast northward to Long Island and should be sought in southern New England. It has been reported in many lists, but all the New England specimens so named which the writer has seen have been either *C. diandrus* Torr., *C. rivularis* Kunth, or *C. Nuttallii* Eddy.

C. Nuttallii Eddy is undoubtedly in brackish marshes on the New Hampshire coast, as it is abundant in southern Maine and in eastern Massachusetts.

C. ovularis (Michx.) Torr. follows the coastal plain northward to southern New York and, as already noted, has been found as an adventive plant in Boston. It should be sought in the sandy regions of southern New England.

C. rotundus L., the Nut Grass of the Southern States, is adventive about New York City and should be watched for near our ports.

C. strigosus L., var. *compositus* Britton occurs on Cape Cod and should be sought in Rhode Island and southeastern Connecticut.

Eleocharis acuminata (Muhl.) Nees, a characteristic species in calcareous regions of northern New York, should be sought in western New England, especially in northern Vermont.

E. Engelmanni Steud. and its var. *detonsa* Gray, although very local in our region, are to be expected throughout southern New England.

E. intermedia (Muhl.) Schultes is common in wet calcareous soils in the northern half of Maine and frequent in northern Vermont. It should be sought in such places, especially marly bogs, in northern New Hampshire.

E. intermedia (Muhl.) Schultes, var. *Habereri* Fernald, now known only from the shores of Oneida Lake, New York, should be sought throughout the range of the species. It is distinguished by its lack of perianth-bristles.

E. interstincta (Vahl) R. & S., extending from Tropical America along the coastal plain to ponds of Rhode Island and eastern Massachusetts is likely to be found in southeastern Connecticut.

E. melanocarpa Torr., likewise, is a coastal species, found in southeastern Massachusetts, in Rhode Island and on the eastern end of Long Island. It is, therefore, probable that it reaches southeastern Connecticut.

E. ovata (Roth) R. & S. is found in wet places in northern Maine and northern Vermont. In Maine it apparently prefers calcareous soils and it should be looked for in such soils in northern New Hampshire. It is readily distinguished from *E. obtusa* (Willd.) Schultes (*E. ovata* of many American authors, not R. & S.) by its very purple-brown scales and by the very narrow tubercle.

E. palustris (L.) R. & S., var. *calva* (Torr.) Gray is apparently a very local plant and any information as to its occurrence is desirable.

E. palustris (L.) R. & S., vars. *glaucescens* (Willd.) Gray and *vigens* Bailey are probably of general distribution in New England.

E. Robbinsii Oakes is abundant in ponds of the coastal region of New England, and it extends inland in the Connecticut valley at least to west-central Massachusetts. It should be confidently watched for in ponds of southeastern Vermont, especially at low altitudes, where occur many other common coastal species, such as *Aspidium simulatum, Selaginella apus, Potamogeton pulcher, Cyperus diandrus, Fimbristylis Frankii, Scirpus Torreyi, Xyris caroliniana, Rhexia virginica,* &c.

E. rostellata Torr. is apparently frequent in salt marshes of eastern Massachusetts and New Hampshire. It is to be expected in the extensive marshes of southern Maine.

E. Torreyana Boeckl. occurs in wet pine-barrens from Florida north to New Jersey and it has recently been found by Messrs. C. B. Graves and R. W. Woodward on the shores of Beach Pond in Voluntown, Connecticut. The head of Beach Pond lies within the state of Rhode Island and the botanists of that state should easily extend the range of *E. Torreyana* into their territory.

E. tricostata Torr. follows the coastal plain from Florida to eastern Long Island. It possibly reaches the pine-barren region of southern New England, and should be watched for on wet sandy shores of ponds.

Eriophorum angustifolium Roth and its var. *majus* Schultz are abundant on the colder bogs of northern and central Maine and probably are of wide distribution in northern New England.

E. Chamissonis C. A. Meyer and its var. *albidum* (F. Nylander) Fernald occur locally in bogs of eastern Quebec and New Brunswick. They delight in the muck of the wettest quagmires and are possibly to be found in such situations in northern and eastern Maine.

E. opacum (Björnstr.) Fernald is as yet but little known in New England. Its recent discovery in eastern Maine and in northeastern Massachusetts suggests that it may be widely distributed in our cold bogs. It is less caespitose than *E. callitrix* (*E. vaginatum* of Am. auth., not L.), forming small loose tufts; its leaves are glabrous instead of scabrous; the upper sheaths are close, instead of conspicuously inflated; its heads are much smaller; and its bristles sordid instead of bright white.

E. tenellum Nutt., var. *monticola* Fernald is a characteristic dwarf plant (1–2 dm. high), with solitary spikelets, in a quagmire by an alpine pond on Table-top Mountain, Gaspé Co., Quebec. It is there associated with *Scheuchzeria palustris, Carex rariflora, C. limosa, C. pauciflora, Rubus Chamaemorus, Potentilla palustris*, and so many other New England plants, as to indicate the possibility that it occurs upon our highest mountains and colder bogs.

E. viridi-carinatum (Engelm.) Fernald, var. *Fellowsii* Fernald has the spikelets all sessile or subsessile, thus suggesting *E. virginicum*. It largely supplants the typical form of the species in the few stations known and may well be sought throughout New England.

Fimbristylis castanea (Michx.) Vahl occurs in marshes and sands along the coast from Florida to eastern Long Island. It should be watched for in southern New England.

Fuirena squarrosa Michx. occurs on sandy margins of ponds in eastern Massachusetts, Rhode Island and on Long Island. It is possibly in similar situations in southeastern Connecticut.

Psilocarya scirpoides Torr. is one of our most local plants, known from a very few wet sandy shores and swamps in Massachusetts and Rhode Island. Its occurrence about a pond at Springfield, Massachusetts, suggests that it may be watched for in Connecticut.

P. nitens (Vahl) Wood grows in mucky or wet sandy shores from Florida to northeastern Long Island. It is to be sought in southern New England.

Rynchospora axillaris (Lam.) Britton occurs in sandy swamps near the coast from Louisiana and Florida northward, and approaches our region in northern Long Island. It should be looked for in the pine-barren area of New England.

R. capillacea Torr. or its var. *leviseta* E. J. Hill occur very locally on wet limestone or in marly bogs in northern and central Maine and northern Vermont and in eastern Quebec. They are probably of wider distribution in northern New England than at present known.

R. macrostachya Torr. has recently been reported with some positiveness from Hartland, Vermont, by Mr. B. P. Ruggles who says, "Some members of the [Vermont] Botanical Club did not agree that [my *R.*] *macrostachyon* is a true *Rhynchospora*, but held that it was a depauperate or abnormal form of some Juncus. However I think it agrees with the description and plate in the Manual and is a true species. I have received the same from Massachusetts with that name and am not willing to give it up." [1] The specimen from Hartland which was referred to the writer was certainly a *Juncus* of the group with nodulose leaves. It is, however, possible that *R. macrostachya* may reach southern Vermont since it is known to extend inland at least to Franklin Co., Massachusetts.

R. macrostachya Torr., var. *inundata* (Oakes) Fernald may be expected throughout the range of the species.

R. Torreyana Gray. This well marked species, which is characteristic of the pine-barrens from New Jersey to Florida, was collected

[1] B. P. Ruggles, Vt. Bot. Cl., Bull. iii, 45 (1908).

by C. F. Parker in 1868 in bogs at East Washington, New Hampshire. Several other coastal plain and pine-barren species,— *Aletris farinosa*, *Ranunculus laxicaulis*, *Sclerolepis uniflora*, etc. — reach extreme northern and inland stations in swamps or on sandy shores of Cheshire and adjacent counties in New Hampshire and most of them occur in the coastal region of southern New England. *Rynchospora Torreyana*, therefore, should be watched for in southeastern Massachusetts, Rhode Island, and eastern Connecticut.

Scirpus Clintonii Gray is abundant on alluvial terraces and even on rocky banks throughout the calcareous-slate region of northern and central Maine; and it is also in northern and western New York. The plant, which is somewhat intermediate in appearance between *S. planifolius* and *S. caespitosus*, should be sought in northern New Hampshire and Vermont.

S. Hallii Gray is one of the most local members of the genus. It has long been known from the shores of Winter Pond, Winchester, Massachusetts, but from no other station northeast of Georgia. Its association at Winter Pond with such plants of southern New England as *Scleria reticularis*, *Eleocharis Engelmanni*, var. *detonsa*, *Crotalaria sagittalis*, *Cassia nictitans*, *Rotala ramosior*, *Coreopsis rosea*, etc. indicates the probability that it will be found about sandy-bottomed ponds in other portions of southern New England.

S. heterochaetus Chase, known from Lake Champlain, Vermont, and from the Charles River in eastern Massachusetts, is to be sought throughout western and southern New England, particularly at sheltered margins of lakes and quiet pools.

S. nanus Spreng. is undoubtedly to be found on the salt marshes of New Hampshire. It is abundant in southern Maine and in eastern Massachusetts.

S. occidentalis (Watson) Chase is frequent in Maine and Vermont especially near the margins of the larger lakes, and it is found locally in eastern Massachusetts. Further observations will probably show it to be widely distributed in New England.

S. pauciflorus Lightf. is found on wet limy rocks or marly shores at several stations in northern and north-central Maine and in northern Vermont. It should be watched for in such situations in northern New Hampshire.

S. rufus (Hudson) Schrad. is one of the characteristic turf-forming plants of salt marshes about the Gulf of St. Lawrence where it is

associated with many of our best known species: *Triglochin maritima*, *Elymus arenarius* L., *Carex norvegica* Willd., *Polygonum Fowleri* Robinson, *Spergularia canadensis* (Pers.) Don, *Glaux maritima* L., var. *obtusifolia* Fernald, etc. Since all these and many other species with which it grows are abundant on the eastern coast of Maine, it is hoped that *Scirpus rufus* may soon be found in that region.

S. Smithii Gray and its var. *setosus* Fernald are often confused in herbaria with *S. debilis* and are probably more widely distributed than at present known. *S. debilis* has the achene biconvex, *S. Smithii* plano-convex, one of the faces being distinctly flattened.

S. sylvaticus L. grows at Hanover, New Hampshire and will probably be found on the Vermont side of the Connecticut.

Scleria. The species of *Scleria* are all very local and little known in New England. Any new stations for them are of unusual interest. They occur chiefly in damp pine-barrens.

GRAY HERBARIUM.

FILIPENDULA RUBRA IN MAINE.— Five years ago in June, I observed near a road which runs through a meadow near my camp a plant with which I was not familiar. In July when it blossomed I determined it to be *Filipendula rubra* (Hill) Robinson and sent a specimen to the Gray Herbarium for verification. Mr. Bartlett wrote me that the plant was what I thought. He says it is native only in the central and southern states though it is commonly cultivated in the East and sometimes escapes. There is however none under cultivation in this town and the plant must have been introduced by grass seed. Mr. Bartlett says it is reported as well established in Vermont and Connecticut but has never been recorded from Maine.

The plant has increased until there is a large clump of it and it presents a striking appearance with its stalks of pink blossoms.— ELIZABETH MEADS MOODY, South Limington, Me.

ADDITIONS TO THE PLANTS OF MOUNT DESERT ISLAND.— Among the many additions to the flora of Mount Desert Island, Maine,[1] made since the publication of the list of 1894, specimens of the following plants have recently come to the Herbarium.

Mention of them may prove of interest at this time.

Lycopodium clavatum L.	
var. monostachyon Grev. & Hook.	F. G. Floyd, E. L. Shaw, S. A. Lurvey.
Carex intumescens Rudge	
var. Fernaldii Bailey	M. L. Fernald
Veratrum viride Ait.	E. L. R.
Cypripedium pubescens Willd.	E. L. R.; E. L. Shaw.
Goodyera tessellata Lodd.	E. L. R.; E. L. Shaw, et al.
Chelidonium majus L.	E. L. R.
Hesperis matronalis L.	S. A. Lurvey.
Apios tuberosa Moench.	E. L. R.
Pyrola secunda L.	
var. obtusata Turcz.	E. L. Shaw.
Viola incognita Brainerd	E. L. Shaw.
Vaccinium Pennsylvanicum Lam.	
var. angustifolium (Ait.) A. Gray	E. L. R.
var. nigrum Wood	E. L. R. et al.
Anagallis arvensis L.	——
Apocynum cannabinum L.	E. L. R.
Myosotis palustris L.	H. Jaques.
Plantago Rugelii Dec.	——
Taraxacum erythrospermum Andrz.	——
Bidens vulgata Greene	M. L. Fernald.
Anthemis tinctoria L.	S. Toppan.
Senecio Robbinsii Oakes	E. L. R.
" viscosus L.	M. L. Fernald: E. L. R.

It is hoped that before long a complete list of additions to the flora can be prepared. Information from other botanists will be gratefully received.— EDWARD L. RAND, Boston.

A NEW STATION FOR IRIS HOOKERI IN MAINE.— On June 27th, 1908, I found on Great Cranberry Isle, a very interesting island lying just off Mount Desert, a large plant of *Iris Hookeri*, Penny. It was growing on the outskirts of a colony of *I. versicolor*,— but nearer the gravelly stony beach,— and was almost through flowering while the latter species was showing its first blossoms. Perhaps this difference in the time of flowering explains why this species has not been reported before from this station by summer visitors. I was unable,

however, to form any conclusion as to its abundance. This island is, I believe, the most southern station for *I. Hookeri* yet reported from the Maine coast.— ELSIE L. SHAW, Lexington, Massachusetts.

SOME MAINE ADDENDA.

J. C. PARLIN.

ON July 7, 1906, I found a few plants of a small, hoary crucifer, growing in association with *Sisymbrium altissimum* L., along a side track, in Canton, Maine, where grain cars are switched off. I laid it aside in my yearly budget for Prof. Fernald, who finds it to be *Erysimum parviflorum* Nutt., a vagrant from the Northwest. Both species named probably were brought in grain.

August 11, 1906, a quantity of *Eragrostis capillaris* Nees, was found growing along the edge of the sidewalk on Point Avenue in Canton Village. Again, on the 16th, I found a large quantity of it near the Gilbertville station in this town. This is the most northern known station of the species, although it was previously known in the state, having been collected at North Berwick several years ago.

While the following are not addenda, they serve to indicate the richness of the flora in this section of the state:— *Anemone cylindrica* Gray; *Caulophyllum thalictroides* Michx.; *Dentaria diphylla* L. *Arabis Drummondi* Gray; *Viola arenaria* DC.; *Aralia quinquefolia* Descne. & Planch.; *Echinacea pallida* Nutt.; *Antennaria Parlinii* Fernald; *A. occidentalis* Greene; *A. Canadensis* Greene, staminate plants; *Petasites palmata,* Gray; *Vaccinium vacillans* Sol.; *Polygonum Hartwrightii* Gray; *Juniperus Virginiana* L.; *Listera convallarioides* Nutt.; *Spiranthes Romanzoffiana* Cham.; *Orchis spectabilis* L.; *Habenaria bracteata* R. Br.; *Cypripedium parviflorum* Salisb.; *C. spectabile* Swartz.; *Scirpus hudsonianus* Fernald; *Carex Pseudo-cyperus* L.; *C. prasina* Wahl.; *C. paupercula* Michx., var. *irrigua* Fernald; *C. virescens* Muhl., var. *Swanii,* Fernald; *C. longirostris,* Torr.; *C. plantaginea* Lam.; *C. deflexa* Hornem.; *C. novae-angliae* Schw.; *C. arcta* Boott; *C. cephaloides* Dewey; *C. foenea* Willd., var. *perplexa* Bailey; *C. leporina* L.; *Phragmites communis* Trin.; *Poa alsodes* Gray.

CANTON, MAINE.

NOTE ON MICHAUX'S VACCINIUM MYRTILLOIDES.

M. L. Fernald.

The name *Vaccinium myrtilloides*, first published by Michaux for a common blueberry of eastern Canada and the Hudson Bay regon, has been variously interpreted. Recently, however, it has rested as a synonym either of *V. pennsylvanicum* Lam. or its var. *angustifolium* (Ait.) Gray, plants to which it has its closest affinity.

Of the common blue-fruited *V. pennsylvanicum* there are three pronounced tendencies. The typical form of the species, the shrub of the eastern United States and of portions of Canada, has the twigs glabrous or at most a little pilose at tip and the leaves glabrous beneath. The dwarf shrub, ordinarily confined to our alpine or colder regions, differs only in its reduced stature and tiny narrow leaves and is var. *angustifolium* (Ait.) Gray (*V. angustifolium* Ait. Hort. Kew. ii. 11). The third extreme is nearly if not quite as pubescent as *V. canadense*, differing from that species in its lustrous leaves with spinulose margins, as in the typical glabrous or glabrate *V. pennsylvanicum*.

The very pubescent extreme of *V. pennsylvanicum* is the common representative of the species in many sections of eastern Canada and it occurs in characteristic development from Labrador to Hudson Bay, south to Newfoundland, Nova Scotia, and northern Maine, and locally to Massachusetts. Throughout this region, as already stated, the shrub is usually mistaken for *V. canadense*; but it has the foliage-characters and the earlier sweeter berries of *V. pennsylvanicum*, and is very clearly the shrub described by Michaux as *V. myrtilloides*. Michaux's specimen, now preserved at the Muséum d'Histoire Naturelle in Paris, was over ripe and each of the two seemingly lateral clusters has lost all but a single berry. The branch shows clearly, however, that other berries had been present. The specimen was examined by the writer in 1903, and a tracing and note made by Dr. Robinson in 1900 bear out the decision that Michaux's plant described "foliis angusto-lanceolatis, integris, subtus juxta nervos et margine pubescentibus, membranaceis: .... *Bluets* Canadensium. *Hab.* a Canada ad sinum *Hudsonis*"[1] is the common pubescent extreme of *V. pennsylvanicum* and that it should not be longer confused with the

[1] Michx. Fl. i. 234 (1803).

glabrous *V. pennsylvanicum* and its equally glabrous var. *angustifolium* but should be given varietal recognition as

Vaccinium pennsylvanicum Lam., var. **myrtilloides** (Michx.) n. comb. *V. myrtilloides* Michx. Fl. i. 234 (1803).

Gray Herbarium.

Draba aurea in Rimouski County, Quebec.— In Rhodora vii. 267 (1905) I reported as *Draba borealis* DC. a plant found in fruit on seacliffs at Bic, Rimouski County, Quebec. Subsequently I have been able to examine the Bic plant at several stations and to secure excellent flowering material. The petals prove to be, not white as in *D. borealis* to which the plant was originally referred, but golden yellow, in this character differing strikingly from the other species of *Draba* known from the lower St. Lawrence. The Bic plant when well developed is by far the largest species of the genus in eastern America, the luxuriant plants producing as many as fifty fruiting branches, the thick and very brittle leaves being 1.5–2 cm. broad, and the mature pods 1.2–1.8 cm. long. Although these luxuriant specimens are much larger and have broader leaves than most herbarium specimens of *D. aurea* Vahl, smaller individuals are apparently identical with that polar species. As noted in the original report of the Bic plant (as *D. borealis*) the juicy leaves and young tips are freely eaten by the Herring Gulls which nest on the limestone rocks at Bic where *Draba aurea* abounds.— M. L. Fernald, Gray Herbarium.

A new Station for Hieracium pratense.— For the last three or four years I have noticed a Hieracium of rather unfamiliar appearance growing in a field near Norwood Cove, at Southwest Harbor, Mount Desert Island, Maine. This year I found plants of the same species in several other fields, not only in the neighborhood, but near Western Mountain and near Beech Hill. On examination it proves to be *H. pratense* Tausch, an introduced plant of very limited range in this country. It has been reported by Mr. Emile F. Williams as occurring at Van Buren, Maine, (Rhodora, III. 36), but I think not elsewhere in New England.— Sam A. Lurvey, Southwest Harbor, Maine.

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CITY BOTANIZING.

William P. Rich.

It is commonly believed that the botanical collector must of necessity get away from the city to find material for his studies and that the open fields and woodlands of the country are the only places of interest to him in the pursuit of his favorite avocation.

It is one of the advantages, however, of plant collecting that the botanist is not always obliged to travel far to find objects of interest to him. If, by reason of the exacting requirements of his daily occupation, he is unable to visit new fields in distant regions during the flowering season, he can generally find close at hand abundant sources of interesting and profitable employment.

There are few localities that will not yield some plants worthy of record, the consideration of which will repay the local botanist for the time devoted to them, and even within the city's limits will be found collecting grounds that may well engage his attention.

In this connection I cannot refrain from referring to a paragraph in an address delivered in 1816 by Stephen Elliott, the author of the "Botany of South Carolina and Georgia." Speaking of his favorite study he said "It has been for many years the occupation of my leisure moments; it is a merited tribute to say that it has lightened for me many a heavy and sometimes many a rugged hour; that beguiled by its charms, I have found no road rough or difficult, no journey tedious, no country desolate or barren. In a solitude never solitary, in a desert never without employment. I have found it a relief from the languor of idleness, the pressure of business, and even the unavoidable calamities of life."

To the sentiments so well expressed in this quotation I am moved to

add the city's claim as a desirable field of botanical observation, and to call attention in this article to some of the plants collected in Boston during recent years which have been of interest to me. The localities mentioned are not those of suburban districts but are in close proximity to busy streets or residential avenues of the city proper.

The first time I ever found *Ranunculus sceleratus* L. was in the ditches along the old Providence Railway, near Newton Street. It grew there abundantly along with *Lemna minor* L. until the draining of the ditches exterminated it and I have seldom met with it since in more extended explorations. My first collection of *Setaria verticillata* Beauv. was in a front yard on Mount Vernon Street, and this also has been infrequently met with. *Chenopodium glaucum* L. I collected for the first time in the crevices of the brick sidewalk on the edge of the Public Garden, and in the last few years *Galinsoga parviflora* Cav. var. *hispida* DC. has been growing freely at the base of the granite wall at the Church Street entrance to the Subway.

But it is the vacant lots and dumping grounds of the city that furnish the city botanist with an almost inexhaustible supply of material. On every visit something new and strange will be seen, perhaps disappearing in a few days, to be replaced by other surprises.

There are two localities in Boston which have proved sources of continual botanical interest for a number of years. One of these, the South Boston flats, now mostly occupied as a railway terminal, has furnished many interesting species, the enumeration of which would require another article and may be left for future presentation.

The other locality is the Back Bay lands and a list of some of the more noteworthy plants collected here at various times in recent years is the principal object of this sketch.

This region, formerly a salt marsh, has been filled in with gravel brought from the neighboring town of Needham. The streets are filled up to city grade, leaving many vacant lots, in some of which the original solid marsh still remains.

For a few years, while the filling was in progress, many native plants and shrubs, brought in with the gravel, maintained their existence, but, at length, most of them succumbed; apparently unable to meet the competition of the hosts of cosmopolitan weeds which soon overran the entire region and now flourish in the greatest luxuriance, forming jungles of vegetation in many of the lots.

The establishment and planting of the Back Bay Fens in later years

have been the sources from which many of the more conspicuous plants herewith mentioned have been doubtless derived. Some of them thrive for a few seasons and disappear while many seem to have taken up a permanent abiding place here, and only the inevitable course of the city's growth will finally destroy them.

In the accompanying record only those plants, for the most part, that are likely to attract the attention of the passer-by or that are of especial botanical interest are noted. The many species of the ordinary weeds and grasses and those that are commonly found elsewhere are omitted.

Perhaps the first flowering plant of the season that will attract notice, other than the willows and poplars, is the *Petasites vulgaris* Desf., one of the coltsfoots. It has flourished on a damp gravelly bank for at least eleven years, sending up in April and May numerous thick, naked flower stalks, succeeded later in the season by enormous leaves a foot and a half in diameter.

In the early part of the summer few plants of especial note are prominent and it is not until later in the season that the richness of the flora is manifested.

In June I have recorded the following species in flower:

Amorpha fruticosa L., a shrub five or six feet high; *Lonicera Morrowii* Gray, rather frequent; *Desmodium Canadense* DC.; *Ptelea trifoliata* L., abundant as a small tree; *Amsonia Tabernaemontana* Walt., a bushy, herbaceous plant, about three feet in height, with milky juice and bluish flowers; and *Coronilla varia* L., very abundant and covering broad areas of gravelly banks with its profusion of rose-colored blossoms.

An Astragalus, growing in one of the lots on Boylston Street, has attracted attention during the past two years, and has been collected in flower and fruit. It has been identified by Prof. M. L. Fernald of the Gray Herbarium as *Astragalus glycphyllos* L. It is a European plant and is probably one of the escapes from the neighboring Back Bay Fens.

In June, 1907, I came across a clump of a trailing, raspberry-like plant with a profusion of small, pale-red flowers. I watched it from week to week until it fruited, to make sure that it belonged to the raspberry section of the genus Rubus. I could find no description of such a plant in any of the horticultural lists or botanical manuals and it was at length identified by Mr. Alfred Rehder of the Arnold Arboretum

as *Rubus triphyllus* Thunberg, a species from Japan. It is still flourishing the present year.

Another Rubus growing here has for several years greatly interested me. It is a coarse-leaved prostrate plant but with the inflorescence and fruiting racemes of the high-bush blackberry, *Rubus argutus* Link. It seems to answer very well to the description of *Rubus villosus* Ait., var. *humifusus* T. & G. of Gray's Manual.

In this month the Russian thistle, *Salsola Kali* L. var. *Tragus* Moq., begins to show itself and is more characteristic in its early stages and differs more from its close relative, the seashore species, than it does later in the season. *Sisymbrium altissimum* L., a comparatively recent immigrant to this part of the country, is also becoming abundant and will be very much in evidence, especially in its later stages of development as a "tumble weed," for the rest of the season.

The July list could be greatly extended by the inclusion of many species that are common outside of the city as well as here, and I shall mention only those in which I have been particularly interested or which are of sufficient importance for botanical record.

Lysimachia vulgaris L. grew abundantly at one time in a vacant lot near where now stands the Institute of Technology on Boylston Street, and not far away from it was a little colony of *Euphorbia marginata*, Pursh. *Heracleum villosum* Fisch., probably thrown out from the Park, has taken possession of several corner lots and is one of the most conspicuous plants in the entire region. *Echinops sphaerocephalus* L., the globe thistle, and *Polygonum cuspidatum* S. & Z., also outcasts from the Park, appear to be happy and thriving in their new locations on the gravelly banks and can be found in many different places. A few plants of *Genista tinctoria* L. were seen in 1906 and in the same season Mr. C. H. Knowlton called my attention to *Epilobium hirsutum* L. which he had discovered in one of the lots.

Another interesting find made July 18, 1906, in company with Mr. Knowlton, was a single plant of *Polygonum arenarium* W. & K. This, as far as I can learn, is the first published report of this species in Massachusetts, although a specimen I collected in July, 1899, on the South Boston flats appears to be the same. *Brassica Sinapistrum* Boiss. and *Brassica juncea* Cosson both grow here, the latter species, however, much more abundant.

The list for August is a long one in my records and must be abbreviated here. *Sida Napaea*, Cav. with its white flowers and maple-like

leaves grows in scattered colonies to a height of six and eight feet and near by can be usually found dense masses of *Bocconia cordata* Willd. attaining an equal height. Various species of sunflowers enliven the masses of vegetation, the most interesting among them being *Helianthus tuberosus* L., *Helianthus strumosus* L., and *Silphium perfoliatum* L., the last species being especially conspicuous. *Inula Helenium* L. has been noticeable in one of the lots for several years.

Polygonums occupy large areas, the principal species being *Polygonum Pennsylvanicum* L., *P. lapathifolium* L., *P. Persicaria* L., and frequently *P. orientale* L. Both species of Datura are found, *D. Stramonium* L. and *D. Tatula* L., and the velvety-leaved *Abutilon Avicennae*, Gaertn. is occasionally seen. *Lespedeza capitata* Michx. is abundant and *Senecio vulgaris* L. and *S. viscosus* L. have been collected. *Ipomoea hederacea* Jacq., *Petunia nyctaginiflora* Juss., *Campanula rapunculoides* L., and the canary grass, *Phalaris Canariensis* L. can be usually found this month on dumping grounds. *Artemisia caudata* Mich. is abundantly distributed over the gravelly levels and, occasionally, in damp places, a few plants of *Lythrum alatum* Pursh. have been seen. The large-headed burdock, *Arctium Lappa* L. var. *majus* Gray, is somewhat frequent on gravelly banks.

Cyperus speciosus Vahl. I first collected here in August, 1879, and it was still in existence in August of the present year. Among the numerous grasses are *Panicum miliaceum* Willd., *Panicum Walteri* Pursh, *Eragrostis Purshii* Schrader, *Bromus tectorum* L., and *Phragmites communis* Trin. The Phragmites I think must be of comparatively recent introduction as it has not yet attained the flowering stage. It is also abundant and spreading in the South Boston locality.

September is, perhaps, if a choice must be made, the best month of all for this kind of botanizing. Most of the August plants are still lingering in flower, while belated species are pushing forward to complete their cycle of life. Noteworthy among the Compositae at this season are *Aster Novae-Angliae* L. and *Aster subulatus* Michx., the latter species very abundant in the marshy lots. In September, 1879, I found *Helianthus rigidus* Desf., but it has been long since covered up. *Pluchea camphorata* DC., one of our native plants, still maintains itself in certain lots. *Artemisia biennis* Willd., mentioned in the Sixth Edition of Gray's Manual as rapidly extending eastward from the West, has since that time arrived in Boston and is now common,

and *Bidens vulgata* Greene, which a few years ago I thought rare is abundant on every hand.

Polygonum prolificum Robinson is plentiful in damp ground inside the Park, and in 1905 Mr. Henry A. Purdie brought me specimens of *Polygonium exsertum* Small from the same place, where I have seen it every year since. Last year I came across a few plants of what I make out to be *Chenopodium Boscianum* Moq., the only time I have ever collected it. *Chenopodium Botrys* L. is occasionally found and *C. ambrosioides* L. var. *anthelminticum* Gray is abundant. *Rumex pallidus* Bigelow has been collected several times and *Amarantus blitoides* Watson, forming flat mats in waste ground, can generally be found this month. *Cassia Chamaecrista* L., *Urtica dioica* L., *Pycnanthemum lanceolatum* Pursh, and *Echinocystis lobata* T. & G. are occasionally met with. *Euphorbia Esula* L. grew here some twenty or more years ago but has now disappeared.

Last year Mr. Purdie called my attention to a goldenrod which he found somewhat puzzling. I made it out to be *Solidago asperula* Desf. and the identification was afterwards verified by Prof. Fernald of the Gray Herbarium. These particular plants seem to have more of the *rugosa* character in them than is usual with those I had heretofore seen, and I am more than ever of the opinion, of which there has long been a suspicion that the so-called *Solidago asperula* Desf. is really a hybrid of *S. sempervirens* L. and *S. rugosa* Mill.

Two shrubs whose origin here can be directly traced to the neighboring Park are becoming noticeable in several of the lots. They are *Baccharis halimifolia* L. and a Tamarix, the species of which I am not sure of. Another herbaceous plant, probably from the same source, is conspicuous with its handsome blue flowers on several gravelly banks in August and September. My first identification of it was *Lycopsis arvensis* L., but Dr. E. H. Eames of Bridgeport, Connecticut, to whom specimens had been sent, pronounced it *Anchusa officinalis* L., which is probably correct. These two species bear very close superficial resemblances.

The nomenclature used in this list is mostly that of Gray's Manual, Sixth Edition, while the names of the garden plants mentioned are those in common use by horticulturists.

I look forward with interest to continued investigation of the flora of this region while it lasts. But the area is being gradually restricted as section after section is built upon and the time is not far distant when

all that will remain of its present profusion of plant life will be the specimens in the herbaria of the few collectors interested in city botanizing.

Boston, Massachusetts.

NOTES ON ALGAE. IX.

F. S. Collins.

Gloeocystis scopulorum Hansgirg in Foslie, Contributions to knowledge of the marine algae of Norway, I. East Finmarken. Tromso Museums Aarshefter XIII, p. 155, 1890. This species was described by Hansgirg from material sent him by Foslie, collected in northern Norway; the material was found in clefts of rocks at high water mark and contained a number of minute forms, some of which Hansgirg described as new, while he identified others with already described species. Prof. Foslie has kindly furnished the writer with some of these forms, among them *G. scopulorum*. It forms gelatinous masses of greenish yellow color with cells 4–6 μ in diameter, united in colonies of two to eight cells, with distinctly stratified envelop. At Ragged Island, off Harpswell, Maine, in July, 1908, the writer found in a warm-water pool, above high water mark, among various small green and blue-green algae, an organism agreeing exactly with Foslie's specimen. But it is well known that in stations of this character plants often undergo strange transformations, *Ulothrix*, for instance, assuming Palmella and Gloeocystis forms that no one would connect with the normal form unless by observing the transitions. One can hardly resist the suspicion that *G. scopulorum* is some such stage of a *Ulothrix* or a *Urospora*, which are common in such stations in spring.

Protococcus ovalis Hansgirg, l. c., p. 159, Pl. III, fig. 12. Another doubtful form occurring in similar stations with the last mentioned species. The cells are ovoid or ellipsoid, 8–10 $\mu \times$ 9–12 μ, with thin wall and yellow-green contents, solitary or congregated in a formless, not specially mucilaginous layer. At the Ragged Island locality a form occurred agreeing with this description, and with the specimen from Foslie.

Pilinia endophytica n. sp. For several years the writer has been puzzled by a small green alga, endophytic in *Ralfsia Borneti* Kuckuck, a common *Ralfsia* along the New England coast on live mussels and *Lithothamnion* in tide pools, occasionally occurring on rocks. In July of the present year, while the writer was dredging in Harpswell Sound, Maine, a stone was brought up from about five meters depth at low water, on which was a growth of *Ralfsia*, in which the endophyte occurred rather more abundantly than usual; while the description that can now be made leaves something to be desired, at least it can be put on record and attention called to the plant, so that further investigation can be hoped for. It may be characterized as follows:—

Fronde formae indefinitae, filamentorum plerumque brevium, simplicium vel ramosorum, sistente, inter filamenta plantae hospitis serpentium; cellulis quoad formam et magnitudinem variantibus, cylindricis, clavatis, subsphaericis, vel irregularibus, 7–22 μ diam., 1–5 diam. longis; chromatophora laete virente, cellulam complente, vel plerumque cupuliformi, partem superiorem cellulae occupante. Sporangiis terminalibus, sphaericis vel ovoideis, ad 30 μ diam., sporas numerosas foventibus.

Frond of no definite form, consisting of usually short, simple or branched filaments, creeping among the filaments of the host; cells variable in form and size, cylindrical, clavate, subspherical or irregular, 7–22 μ diam., 1–5 diam. long; chromatophore light green, sometimes filling the cell, more commonly cup-shaped, at the upper end of the cell. Sporangia terminal, spherical or ovoid, up to 30 μ diam., containing numerous spores. In fronds of *Ralfsia Borneti* Kuckuck, Harpswell, Maine, July, 1908. Type in herb. F. S. C.

The placing this species in the genus *Pilinia* might be considered somewhat intuitional, as the vegetative characters are so vague; but imperfect and stunted as the filaments are, their appearance recalls that of undoubted Pilinia species. The occurrence of the terminal sporangium seems to confirm this, but the form must be regarded as greatly modified by the endophytic habit. All distinction between vertical and horizontal filaments is lost, and the cells are very irregular in shape and size; sometimes a filament will be found of six or seven cylindrical or slightly clavate cells, 2–5 diam. long, quite as in typical Pilinia species, but this is unusual. Whether the sporangia produce zoospores or aplanospores could not be determined. The nearest relation of this species would seem to be *P. minor* Hansg. If we may imagine a descent from the latter, from living free on pebbles to living

among the firm and closely packed filaments of the *Ralfsia*, the disappearance of the now useless basal, attaching filaments, and the irregular form of what remains, seem not unnatural. The host is found all along the New England coast from Bridgeport, Connecticut to Cutler, Maine, and whenever it has been examined for the endophyte, the latter has been found.

PRINGSHEIMIA SCUTATA Reinke. When the writer was collecting at Eastham, Massachusetts, Aug. 16, 1908, at "The Salt Pond," really the head of a bay among salt marshes, the Zostera growing there abundantly was found to be the host for many of the smaller species of algae; most of these were familiar and require no comment, but it was of interest to note *P. scutata*, of which only a single record appears for this coast.[1] Here it was not uncommon, and a set for distribution in the Phycotheca was easily obtained. The plant forms minute, rounded, thin, pale green dots on the Zostera, barely perceptible to the naked eye, but easily distinguished by the hand lens.

OCHLOCHAETE FEROX Huber, Ann. Sci. Nat., Series 7, Bot., Vol. XVI, p. 292, 1892. In looking over the material mentioned in the last paragraph, it was noticed that some spots were of a much deeper green color than the others, and microscopic examination showed quite a different structure. In *Pringsheimia* there is originally a thin disk of laterally united radiating filaments, later developing another layer in the middle part of the disk, the cells of this second layer rounded but with no outgrowths. In the other form the frond consists of a densely packed mass of cells, with no indication of radiating filaments; the cells are ovoid or flask-shaped, vertically elongate, and terminate each in a long colorless hair. These characters identify it with *O. ferox*, not before recorded for America. Though not quite as frequent as the *Pringsheimia*, enough was found for distribution in the Phycotheca Boreali-Americana, and both species will appear in Fascicle XXXI.

SPHACELARIA FUSCA C. Ag., Sp. Alg., Vol. II, p. 34, 1828. This species, though dating from so long ago, was always a matter of doubt until Sauvageau,[2] brought forward the characters that distinguish it from the common *S. cirrhosa* (Roth) Ag. The latter species is abundant on the New England coast from Cape Cod south, and is occasionally found, usually in warm, sheltered bays, as far north as the Gulf

[1] Collins, Bull. Torrey Bot. Club, Vol. XVIII, p. 340, 1891.
[2] Sauvageau, Jour. de Bot., Vol. XVI, p. 209, 1902.

of St. Lawrence. June 16, 1907, the writer found on the bay shore of Eastham, Massachusetts, growing on a spider crab, *Libinia canaliculata* Say, what appears to be *S. fusca*. *S. cirrhosa* is a variable species, and as regards most characters it is hard to draw a line between it and *S. fusca*; the most conspicuous character is found in the propagula; in *S. cirrhosa* the three rays are sharply contracted at the base; in *S. fusca* there is no such contraction, the rays being cylindrical or tapering slightly from base to summit.

PETROCELIS MIDDENDORFFII (Rupr.) Kjellman, Algae of the Arctic Sea, p. 140, 1883. The first notice of the occurrence of *Petrocelis* on the New England coast is by Farlow [1] under the name of *P. cruenta* J. Ag.; this name has since been retained in all references to the plant of this region. A comparison with a specimen from Cherbourg, France, collected and determined by Le Jolis, shows so much difference that the two cannot be considered as belonging to the same species. The frond in *Petrocelis* forms an incrustation on rocks at or near low water mark on exposed shores; it is thin but not as thin as the frond of the common *Hildenbrandtia prototypus* Nardo; the latter is more or less translucent, the color being a lighter or darker red according to the color of the substratum. The Petrocelis frond is quite opaque and usually of a duller red. It consists entirely of vertical filaments, in which two parts can be distinguished; a lower layer in which the filaments are firmly united laterally, and an upper layer in which they are in contact, but do not adhere. On the top is a relatively firm cuticle. When the cover glass is pressed down on a bit of the plant under the microscope, it is common for the filaments of the upper part to be held by the basal part below and by the cuticle above, while separating easily between. In the European plant the basal part is only a small portion of the whole thickness, while in the New England plant it is seldom of less thickness in a mature plant than the upper part, and often it is two thirds of the whole thickness. In the European plant the cells of the free filaments are moniliform, 1–2 diam. long, about 8 μ diam. at the base, diminishing to 4 μ at the top. In the American plant the filaments are cylindrical or only slightly tapering, 3–4 μ diam., cells up to 3 diam. long. These characters indicate that our plant is *P. Middendorffii*, a plant probably of circumpolar distribution, as it occurs in Norway, and in the Pacific from Alaska to California.

[1] Farlow, N. E. Marine Algae, p. 115, 1881.

That the distinction has not before been made is not unnatural; our plant does not grow on small or loose stones, it seems to prefer the hardest rock, seldom occurring on soft or crumbling rocks, where it could be easily removed. It cannot be scraped off without reducing it to a shapeless mass, but a knife must be used, and unless special care is taken, the greater portion of the basal part is left on the rock. In material so obtained the difference between the basal part and that of *P. cruenta* is not noticeable. The material distributed in P. B.–A., No. 899, is of this character; it is intended to distribute another lot, of more perfect material, which will show the identity with the *P. Middendorffii* of the west coast, distributed as P. B.–A., No. 900.

The tetraspores of *Petrocelis* are formed by transformation of cells of the upper part; in *P. cruenta* and *P. Middendorffii* one cell in a filament is so transformed, rarely two cells. In *P. Hennedyi* (Harv.) Batters of northern Europe the tetraspores are seriate, often occupying a considerable portion of the filament; this species may occur with us. Unfortunately, spores in *Petrocelis* are rare, except in winter, which is not a pleasant time to collect on exposed shores at low water mark. The writer has examined specimens of *Petrocelis* from Nahant and Magnolia, Massachusetts; from Mount Desert Island, Cutler, several points in Penobscot Bay and several points in Casco Bay, Maine; after allowing for the effect on the basal layer of the manner of collecting, they agree very closely; specimens from Scotland and England agree equally well with Le Jolis' plant. The writer formerly reported *P. cruenta* as occurring in Southern Massachusetts;[1] a re-examination of the specimen shows that it is not a *Petrocelis*; so that as far as our records go, the genus is limited to the region north of Cape Cod.

The marine flora of the New England coast from Cape Cod north is of a typical arctic character, but as is well known, there are exceptional stations where plants characteristic of more southern regions occur; such stations have been recorded at Weymouth and Quincy, Massachusetts,[2] Gloucester, Massachusetts,[3] Penobscot Bay, Maine.[4] At all these stations there is much variation from one year to another, apparently on account of the difference in temperature, etc., in different years. An early spring, followed by a warm summer, will bring an abundant development of characteristic southern forms, while

[1] Bull. Torrey Bot. Club, Vol. X, p. 56, 1883.
[2] Collins, Bull. Torrey Bot. Club, Vol. X, p. 29, 1884.
[3] Farlow, N. E. Marine Algae, p. 6, 1881.
[4] Collins, Rhodora, Vol. I, p. 69, 1899.

in a year in which the spring is late and the summer not warmer than the average few or none may appear. The past summer would seem to have been an ideal one for these plants, the excess of temperature above the normal for the year being about 400° at Boston on the first of August. The writer had an opportunity in July to observe two stations, not previously recorded in this respect, and the following notes may have some interest.

Along the New England coast as far north as Portland, Maine, salt marshes form quite a considerable portion of the shore, but beyond Portland they are less common. At Stover's Point in South Harpswell is a small salt marsh, separated from Harpswell Sound by a ridge of stones and gravel, through which there is a quite narrow and shallow opening. Except at spring tides the change of level in the numerous shallow pools of various size that are scattered through the marsh is slight, and the greater part of the water remains from one tide to another. In the hot days of last July the water in these pools was almost unpleasantly warm to the hand. The felty mass of algae, usual in such places, covered the smaller pools, and much of the surface of the larger pools. The composition of this mass was the common warm water combination, *Cladophora expansa* (Mert.) Kütz., *Rhizoclonium riparium* (Roth) Harv., *Lyngbya aestuarii* (Mert.) Liebm., *L. confervoides* Ag., *Enteromorpha intestinalis* (L.) Link, *E. crinita* (Roth) J. Ag., *E. Hopkirkii* McCalla, *Ilea fulvescens* (Ag.) J. Ag., and in less quantity *Pleurocapsa fuliginosa* Hauck, *Calothrix confervicola* (Dillw.) Ag., *C. scopulorum* (Web. & Mohr) Ag., *C. aerugínea* (Kütz.) Thuret. *Palmellococcus marinus* Collins, described from material collected here in 1906, was present this year, but in less quantity; and there was considerable of two blue-green algae, usually found only in fresh water, *Nostoc sphaericum* Vauch. and *Gomphosphaeria aponina* Kütz.

In the largest pool were floating many fragments of algae, naturally growing in exposed places, the same as are found washed up all along the shore; but in this warm water they had assumed a quite different appearance. *Chondrus crispus* (L.) Stack. was abundant, and the fronds had continued to grow with a luxuriance quite unknown before; fronds two or three dm. long were not uncommon, broad and richly branched, often with proliferous growths; the color pale red or yellow; evidently the environment was much to their liking. Common also were floating fronds of *Ahnfeltia plicata* (Turn.) Fries, but all were

dead; the normally dark and shining wiry fronds were a brownish yellow, and their surface was variegated with "collars" of *Ralfsia verrucosa* Aresch. The *Ahnfeltia* is common all along the Maine coast, as is also the *Ralfsia*, but the latter has never been observed to grow on the former under normal conditions. Luxuriant coatings of *Ralfsia* were found on the dead or dying floating fronds of *Fucus vesiculosus* L., *F. evansecens* Ag., and *Ascophyllum nodosum* (L.) Le Jolis. The *Ralfsia* formed a continuous coating on practically the whole surface of these fronds, though never occurring on them in their natural habitat, whether attached or floating.

The other locality noticed was at Ragged Island, about five miles off the Maine shore, between Cape Elizabeth and Cape Small Point. The island is about half a mile in diameter, the coast entirely rock cliff, often rising perpendicularly for some height. On the south side there are perpendicular rocks of this character, the top considerably above even the spring tides. From some peculiarity of this rock, there is a series of rather large and deep pools just back from the edge; into these pools a certain amount of fresh water drains from the neighboring part of the island, but the supply must be small; apart from this, and whatever rain falls into the pools, the only supply is from the surf breaking over the wall. During a gale this supply must be continuous, but in ordinary weather it is cut off. It is evident that a great range in temperature and salinity is possible here. If we suppose the pools filled by a storm, and then a long period of quiet weather without rain, the salinity must steadily increase. A rainfall would somewhat diminish it, but only a very heavy rain, sufficient to fill the pools and run over, could bring the salinity below that of the surrounding sea. The salinity would be higher than normal until a severe storm should throw in water enough to fill the pools several times over, practically replacing the contents with normal salt water. Whenever the pools were so filled, the temperature would be that of the sea, which here is very cool, even at midsummer, while in winter they would be undoubtedly frozen, and a few hot calm days in summer would bring them to a temperature reached by the sea only in the tropics. The list of permanent tenants of such a pool would be reduced to forms capable of enduring very salt water as well as the ordinary salinity, and both tropical and arctic temperatures. On the other hand, plants developing very quickly under favorable conditions, forming at once spores that will carry them through unfavorable condi-

tions, would delight in such a station, where there would be few or no all-the-year natives to compete with these summer visitors to the Maine coast.

On July 13, 1908, there was here an immense quantity of individuals, though not very many species; most of them were blue greens; *Polycystis elabens* Kütz., *Entophysalis granulosa* Kütz., *Gloeocapsa crepidinum* Thuret, *Oscillatoria tenuis* Ag., *Spirulina subsalsa* Oersted, *S. Meneghiniana* Zan., *Lyngbya aestuarii* (Mert.) Liebm., *L. semiplena* (Ag.) J. Ag., *L. subtilis* Holden, *Plectonema Battersii* Gom., *P. calothrichoides* Gom., *Anabaena torulosa* (Carm.) Lagerh., *Nodularia Harveyana* (Thwaites) Thuret, *N. spumigena* Mert., *Calothrix scopulorum* (Web. & Mohr.) Ag., *Amphithrix violacea* (Kütz.) Born. & Flah., and some forms of *Chroococcus* and *Plectonema* that have not been specifically determined. The green algae were *Enteromorpha intestinalis* (L.) Link, *E. Hopkirkii* McCalla, *E. crinita* (Roth.) J. Ag., *Cladophora expansa* (Mert.) Kütz., *Ilea fulvescens* (Ag.) J. Ag., and *Urococcus Foslieanus* Hansg. The *Entophysalis* was chiefly attached to the rocks; the *Calothrix* and *Amphithrix* to *Enteromorpha* and *Cladophora*; all the others were free and mingled in all proportions; sometimes in loose masses on the bottom, sometimes in rather denser masses at the surface; the color varying according to the proportion of the different species and to the exposure to light; the strata at the bottom, sheltered from the light, were mostly dark green or olive; those at the surface pale green, yellowish or almost white. The quantity was astonishing; at least half the surface was covered by the mats, and very little of the bottom could be seen. When we remember than an individual of *Polycystis* is about 3 μ diameter, about one ten-thousandth of an inch, while a filament of *Spirulina* is considerably less, the number of individuals in these pools, with a surface of perhaps an acre and a depth of several feet, would reach a figure with no real meaning to us. And there is no doubt that the entire quantity had developed since the beginning of the warm weather. The winter storms must sweep the pools clear of all such vegetation, except stray spores or resting cells in crevices or under ice.

The writer visited this station in 1903 and in 1906, each season in July, and the conditions were then much the same, but in 1908 the growth was considerably more luxuriant than before, and the level of the water decidedly lower, which of course meant increased salinity. The effect of the latter condition was seen in some abnormal appear-

ances in the Enteromorphas, which are most at home in ordinary sea water; in an increase in the Spirulinas, which are specially plants of lagoons and drying-up pools. Possibly these conditions may have induced the development of *Gloeocystis scopulorum*, mentioned earlier in this paper, from some Ulothrix which was here earlier in the season, but could not maintain its normal form under the summer conditions.

One species remains to be mentioned; *Chaetomorpha aerea* (Dillw.) Kütz. This is usually spoken of as a common species on the New England coast, and if we include under the name the free-floating form known as *C. Linum* (Fl. Dan.) Kütz., just as what has been known as *C. Picquotiana* (Mont.) Kütz. is now considered a free form of *C. Melagonium* (Web. & Mohr) Kütz., this opinion is undoubtedly correct; the *C. Linum* form abounds from Long Island Sound to Passamaquoddy Bay. But as to the attached plant, *C. aerea* in the older sense, the case is different. South of Cape Cod it is not uncommon and grows at low water mark and some distance above and below; but in 30 years collecting the writer has only twice found it north of Cape Cod, and in each case it was in a rock pool, at extreme high water mark; once at Cohasset, once at Marblehead, in both cases in small quantity. Here at the Ragged Island pools there was a dense growth around most of the edge, just below the water line; as densely packed as the grass in a lawn. The filaments were all quite short, and there was a white band of dead fronds, above the water level, considerably broader than that of living fronds below the level; evidently the environment had been exceptionally favorable to the species earlier in the season. In 1903 and 1906 nothing was seen of this species, and if we suppose that it is distinct from the floating *C. Linum*, it would be hard to account for its sudden appearance in such quantity; the currents here tend southerly, and the chance of a frond or a spore being brought from southern New England and thrown up by the waves into the pool would be very small. Even if this were possible, there must have been several generations of plants in a very short time to produce this dense growth for such a distance. But if we suppose that it arose from the floating form, which is abundant in the vicinity, the spores finding favorable conditions, similar to those of warmer regions, all is clear.

To sum up as regards these two stations:— even on shores where conditions are subarctic, individual stations may be found where the conditions for a short time are almost subtropical; in such stations the

number of species must be limited, but the number of individuals developed in a short time may be enormous; they will be mostly plants of very rapid development and of short life, and mostly of quite low organization; some plants, common in the subarctic waters may here assume a sudden luxuriance (*Chondrus*); some may also appear on a different substratum (*Ralfsia*); some may take on a habit so distinct as to be considered a separate species native to lower latitudes (*Chaetomorpha*).

MALDEN, MASSACHUSETTS.

A TRIP TO KILLINGLY, CONNECTICUT.

CLARENCE H. KNOWLTON.

AFTER considering several other places for a one-day botanical excursion, Mr. L. J. Spalding and I finally decided on Killingly, Windham county, Conn. We were led to this by a study of the map, which revealed a diversified region ranging in elevation from 280 to 875 feet above sea-level, with brooks, ponds and hills. A previous reconnoissance in July, 1903, had shown us that the underlying rocks were sandstone and quartzite. We had also noted and collected several interesting plants at that time.

The day chosen (Aug. 23, 1908) was clear and cool after heavy rainfall, the vegetation was fresh, and walking easy. We left the cars at Attawaugan, and the first plant collected was *Commelina communis* L. It grew luxuriantly in the woods near Five-Mile River, on a bank which had been used as a dump at some time previous. The delicate blue flowers were still open, and the plant seemed to flourish in its adopted home.

The next accession grew abundantly in the millyard and by the roadside at Ballouville. This was *Euphorbia hirsuta* Wiegand, easily distinguishable from its nearest relative by its hairy stem, smooth fruit and peculiar seed. These specimens were not so nearly prostrate as *E. maculata* L. usually is.

We now left the villages and explored a large meadow, part of which had been mowed. In this part grew good specimens of *Parnassia Caroliniana* Michx., just coming into flower. In the uncut portion, along with many common plants, were *Pycnanthemum linifolium*,

Pursh, *P. lanceolatum* Pursh, and *P. muticum* Pers., all these closely allied species occupying the same territory, and showing no choice in the matter of soil or moisture. Later in the day we found the fourth New England representative of the genus, *P. incanum* Michx., growing in dry rocky woods. The prevailing alder in this meadow and throughout the town seems to be *Alnus incana* Willd., for I did not see any other during the entire day. *Calamagrostis Nuttalliana* Steud. also flourished in this meadow.

The road led from the lowland up the side of Break Neck Hill, and wayside glimpses of *Circaea alpina* L., the true *Viola blanda* of Willdenow, and big clumps of *Collinsonia canadensis* L. led to an investigation of the rich woods near by. The *Collinsonia* is a frequent plant throughout the region in such woods, and its presence was not unexpected, but further search showed an abundance of *Allium tricoccum* Ait., in excellent fruit, *Adiantum pedatum* L., *Galium lanceolatum* Torr., *Eupatorium ageratoides* L., *Sanguinaria canadensis* L., *Trillium cernuum* L., *Uvularia perfoliata* L. and mountain laurel. The woods were largely red oak, chestnut, cherry birch and sugar maple. Part had been cut over within ten years, while the other part had not felt the axe for at least forty, but there was little difference in the herbaceous flora beneath their shade.

Further up the hill were open pastures and clearings, with ledges which gave fine views of neighboring villages, and the level sky-line of the Windham county hills. Over the dry ledges grew *Woodsia obtusa* Torr. and the more common ebony spleenwort, while in moist shaded crevices grew *Asplenium Trichomanes* L. The dry clearings were full of *Gerardia quercifolia* Pursh in full bloom, very tall and handsome. *G. flava* L., *G. pedicularia* L. and *G. tenuifolia* Vahl were also present, but only the latter was abundant. *G. paupercula* (Gray) Britton we had found in our first swamp. Along with these were some very fine specimens of *Hieracium Gronovii* L., two or three feet high, and on one ledge in the hot sunshine grew *Muhlenbergia glomerata* Trin., undismayed by changed environment.

Down beyond the clearings was another stretch of rich woods, colder and more moist than the first, and here came the greatest surprises of the day. First of all was *Habenaria Hookeriana* Gray, with broad flat leaves and spikes of appressed green flowers, and fruit. Further search for this revealed as its neighbors *H. bracteata* R. Br. and *Corallorrhiza multiflora* Nutt., also well fruited, and several

specimens of each were collected, without seriously affecting the supply. There were also good colonies of *Monotropa Hypopitys* L., bright scarlet instead of golden yellow, their prevailing color. Along a brook were splendid plants of *Phegopteris hexagonoptera* Fée, only waiting the hand of the collector to transfer their beauty to the herbarium.

Reluctantly we left these woods, and investigated some of the mill-ponds beyond East Killingly, near the Rhode Island line. Two of these were well filled with *Myriophyllum ambiguum* Nutt., var. *capillaceum*, Torr. & Gray, while *Brasenia* was the prevailing plant in the others. The largest pond, Chestnut Hill Reservoir, was covered with the peltate leaves, which concealed the water and gave a peculiar leathery effect to its surface. I finally secured a specimen of this slimy plant, with leaves uneaten by the insects. Along the roadside thickets near the ponds were large quantities of *Apios tuberosa* Moench both in flower and fruit, and occasional plants of *Solidago Elliottii* T. & G. just coming into bloom.

Our next point was a steep unnamed hill near Elliotville, which we had visited in 1903. The eastern side of this is a big cliff of slightly metamorphosed sandstone, varying from 20 to 60 feet in height, with its white escarpment broken by fracture planes and caves, far surpassing in natural interest the more famous Wolf Den region of Israel Putnam in the adjoining town of Pomfret. In the woods here grew an abundance of *Clematis verticillaris* DC. and *Oryzopsis melanocarpa* Muhl. The westerly side of the hill proved ordinary and uninteresting, except for a curious side-hill peat-bog, caused probably by some hidden spring. Mr. Spalding has since found a large tree of *Betula papyrifera* Marsh on the southwest corner of this hill.

Whetstone Brook flows through the little valley below, on its way to join the Quinebaug River. In one of its tributaries grew *Sium Carsonii* Durand, but it did not seem to flourish in the main brook, where the water was too deep or the current too swift for this lazy degenerate of a worthy type. The brook gets its name from the easily cleaving, fine-grained sandstone of the region, and flows through rather ordinary meadows full of *Carex stricta* Lam., to the exclusion of most other species. There were fine colonies of *Sparganium americanum* Nutt. in some places, and in others there were *Xyris flexuosa* Muhl., *Peltandra*, *Decodon*, and *Rhexia*. At our 1903 visit we found large quantities of *Ranunculus aquatilis* L. var. *trichophyllus* Gray,

exceptionally large specimens, but we did not find it this time, probably because it was too late. *Lonicera caerulea* L. is a frequent shrub along the meadows.

Our last collecting for the day was in Putnam, Conn., where we excited the distrust of the natives by groping successfully in the dusk of early nightfall for *Vernonia noveboracensis* Willd., and *Liatris scariosa*, Willd., conspicuous plants which we had located on the morning journey, and reserved for our homeward way.

All in all, we considered the day a very successful and enjoyable one, and the region well worth further exploration. Most of the plants mentioned are represented by specimens in my collection or Mr. Spalding's, and although but few are distinctly rare, many of them belong in that larger class so well known to botanists as "interesting."

I am indebted to Mr. Walter Deane for kindly assistance in identifying the *Myriophyllum* and the *Sparganium*.

Boston, Massachusetts.

Four Introduced Plants at Cambridge, Massachusetts.— On 31 July of this year I noted, beneath a hedge-row along a street in Cambridge, a specimen of *Neslia paniculata* (L.) Desv., a crucifer with small, globose, indehiscent, reticulated silicles. The specimen was a small one but the distinctive fruit made it easily determinable. I have gathered it in better condition and greater abundance on docks at Quebec, 31 August, 1904. *Thymus Serpyllum* L. was found in abundance in a plot of grass land in Cambridge on 23 July of this year, and on 8 August another patch about a half-mile away, across the Charles River, near Soldiers' Field in Brighton. On 8 August I came across a bush of *Colutea arborescens* L. escaped by a roadside near Mt. Auburn Cemetery. *Epilobium hirsutum* L. is well established near Glacialis Pond, Cambridge. Specimens of these plants are in my herbarium.— Arthur Stanley Pease, Cambridge, Massachusetts.

New Edition of Gray's Manual.— We have received just as we are going to press the seventh edition (illustrated) of Gray's Manual,[1] which will be reviewed in a subsequent issue of Rhodora.

[1] A Handbook of the Flowering Plants and Ferns of the central and northeastern United States and adjacent Canada rearranged and extensively revised by Benjamin Lincoln Robinson and Merritt Lyndon Fernald. American Book Co., New York. $2.50.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,—XXII.[1]

M. L. FERNALD.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

NAJADACEAE.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Najas flexilis (Willd.) Rostk. & Schmidt	+	+	+	+	+	+
" " var. robusta Morong				+		
" gracillima (A. Br.) Magnus				+	+	+
Potamogeton alpinus Balbis	+	+	+	+		+
" americanus C. & S.	+	+	+	+	+	+
" " var. novaeboracensis (Morong) Benn.						+
" amplifolius Tuckerm.	+	—	+	+	+	+
" angustifolius Berchtold & Presl			+	+		—
" " var. connecticutensis (Robbins) Benn.			+			+
" bupleuroides Fernald	+	+	+	+	+	+
" confervoides Reichenb.	+	+	+	+		
" crispus L.				+		—
" dimorphus Raf.	+	+	+	+	+	+
" epihydrus Raf.	+	+	+	+	+	+
" " var. cayugensis (Wiegand) Benn.	+					+
" × Faxoni Morong			+			
" filiformis Pers.	+		+			
" foliosus Raf.	+	—	+	+	+	+
" " var. niagarensis (Tuckerm.) Morong	+	+	+			
" Friesii Rupr.			+	+		+
" gemmiparus Robbins	+			+	+	+
" heterophyllus Schreb.	+		+	+	—	+
" " forma graminifolius (Fries) Morong	+	+	+	+	+	+
" " forma longipedunculatus (Merat) Morong	+		+	+	+	+

[1] Printed in RHODORA as supplementary matter.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Potamogeton heterophyllus forma maximus Morong	+	+		+		+
" " forma myriophyllus (Robbins) Morong	+			+	+	—
" " forma terrestris Schlecht.	+		+			+
" Hillii Morong						+
" hybridus Michx.	+	+	+	+	+	+
" " var. multi-denticulatus (Morong) Asch. & Graebn.						+
" lateralis Morong				+		+
" lucens L.	+		+	+		+
" mysticus Morong				+		
" natans L.	+	+	+	+	+	+
" × nitens Weber	+	+		+		
" Oakesianus Robbins	+	+	+	+	—	+
" obtusifolius Mertens & Koch	+		+	+		+
" pectinatus L.	+	+	+	+	+	+
" perfoliatus L.	+					
" praelongus Wulfen	+	+	+	+		+
" pulcher Tuckerm.	+		—	+	+	—
" pusillus L.	+	+	+	+	+	+
" " var. polyphyllus Morong	+			+		
" " var. Sturrockii Benn.	+		+	+		+
" " var. tenuissimus Mertens & Koch	+	+	+	+		
" Richardsonii (Benn.) Rydb.	+	+	+			+
" Robbinsii Oakes	+	+	+	+	+	+
" rutilus Wolfgang	+		+			
" × spathaeformis Tuckerm.				+		
" strictifolius Benn.	+	+	+	+		
" Vaseyi Robbins	+		+	+		+
" zosterifolius Schum.	+		+	+	—	+
Ruppia maritima L.	+	—		+	+	+
Zannichellia palustris L.	+	+	—	+	+	+
" " var. pedunculata J. Gay				+		
Zostera marina L.	+	—		+	+	—

JUNCAGINACEAE.

Scheuchzeria palustris L.	+	+	+	+	+	+
Triglochin maritima L.	+	—		+	+	+
" palustris L.	+					

NOTES UPON THE ABOVE LIST.

Potamogeton confervoides Reichenb. This species (as *P. Tuckermani* Robbins) is listed without station in J. L. Bennett's Plants of Rhode Island. There is no specimen in Mr. Bennett's herbarium, and the occurrence of this unique species chiefly in subalpine or very cold ponds indicates that its Rhode Island record is extremely doubtful.

P. perfoliatus L., although reported from all the New England states, has been examined only from Maine. All the material from the other New England states seen by the writer has been either *P. bupleuroides* Fernald or *P. Richardsonii* (Benn.) Rydb.

Many minor hybrids are recognized by Old World students of *Potamogeton*. Little has been done in America to make out our hybrid forms and most such plants are at present omitted from the list.

SUGGESTIONS FOR SPECIAL OBSERVATION.

Najas flexilis (Willd.) Rostk. & Schmidt, var. *robusta* Morong. This extreme form is known in New England only from ponds of eastern Massachusetts. It is found, however, in New York and should be sought in Rhode Island and Connecticut.

Najas guadalupensis (Spreng.) Morong, quickly distinguished from *N. flexilis* by its dull conspicuously reticulated seed, extends northward from Tropical America to eastern Pennsylvania, and has recently been reported from southern New York. It is to be expected in southeastern Massachusetts and Rhode Island.

Potamogeton angustifolius Berchtold & Presl, var. *connecticutensis* (Robbins) Benn. (*P. lucens*, var. *connecticutensis* Robbins) has the 3-keeled fruit of *P. angustifolius* but differs in its greater size, its fruits being 4–4.5 mm. long, while those of *P. angustifolius* are 3–4 mm. long. The variety is known in Vermont and Connecticut, and should be sought in central and western Massachusetts.

P. epihydrus Raf., var. *cayugensis* (Wiegand) Benn. (*P. Nuttalii*, var. *cayugensis* Wiegand) occurs in eastern Maine, in Connecticut, and in Lake Memphremagog, Quebec, and is to be sought in lakes of New Hampshire, Vermont, and western Massachusetts. It differs from the common *P. epihydrus* (*P. pensylvanicus* Willd., *P. Nuttalii*

C. & S.) in its larger floating leaves (29–41-nerved), its broader submersed leaves (9–13-nerved) and its large fruit (3.5–4.5 mm. long).

P. filiformis Pers. occurs locally in northern Maine and northern Vermont. In Maine and Quebec it is apparently confined to shallow ponds and streams with marly bottoms, and it should be sought in such situations in northern New Hampshire.

P. gemmiparus Robbins is frequent in slow streams and pools through southern Maine and it occurs in eastern and central Massachusetts, Rhode Island, and northeastern Connecticut. It should, therefore, be found in southern New Hampshire.

P. heterophyllus Schreb. The different forms are apparently due in great part to the conditions under which they grow and probably are all of more general distribution than the herbaria indicate.

P. interruptus Kit., differing from *P. pectinatus* in its strongly keeled fruit, occurs in brackish waters of eastern New Brunswick and also in Michigan. Search may readily show it to be on the New England coast as well.

P. lateralis Morong, occurring in eastern Massachusetts and in northern Connecticut, is to be sought, naturally, in Rhode Island.

P. obtusifolius Mertens & Koch, frequent in north-central Maine and in Vermont, should be sought in northern New Hampshire. In Maine it prefers clear cold streams.

P. polygonifolius Pourret, a common species of Eurasia, Greenland, and even of Africa and Australia, occurs in Newfoundland and on the coast of Nova Scotia. It has the aspect of a very reduced *P. pulcher*, with extremely slender spikes, the tiny fruits being only 1.5–2 mm. long. It is to be watched for in eastern Maine.

P. pulcher Tuckerm. This distinct species is frequent in eastern Massachusetts, and it is known from southern Maine and from Brattleboro, Vermont (according to Morong). It is, therefore, to be expected in southern New Hampshire.

P. pusillus L., vars. *polyphyllus* Morong and *Sturrockii* Benn., likewise, should be looked for in southern New Hampshire.

P. rutilus Wolfgang, one of our rarest species, is known from the St. Francis River in northern Maine and from a single station in Lake Champlain. It resembles very slender extremes of *P. pusillus*, but has much longer stipules, which are persistent and rather conspicuous; and its sharp-acuminate leaves are almost erect.

P. Vaseyi Robbins is apparently more common than generally supposed and is probably well distributed in southern New England.

Triglochin maritima L., in spite of its usually maritime habitat, is frequent on wet shores and in mossy swamps of northern and north-central Maine and it also occurs in swamps of interior New York. In Aroostook County, Maine, it is associated in Larch and Arbor Vitae Swamps with *Cypripedium hirsutum* Mill, *Valeriana uliginosa* (T. & G.) Rydb., &c., and it may be looked for in similar situations in northern New Hampshire and Vermont.

T. palustris L. is also of wide distribution in Maine. It is a common plant of limy or slightly brackish wet places in the northern section of the state as well as in northern New Brunswick and Quebec; and it follows the coast, in brackish marshes, to Wells, near the New Hampshire border. The species may be confidently sought on the coast of New Hampshire as well as in marly bogs of northern New Hampshire and Vermont.

GRAY HERBARIUM.

MEETING OF THE JOSSELYN BOTANICAL SOCIETY.— The fourteenth annual meeting of the Josselyn Botanical Society of Maine was held at Manset, Mt. Desert Island, Maine, from August 4th to 6th. About a dozen members and guests were present. Unfortunately the weather did not prove as favorable as was hoped, but in other respects the meeting was very successful. Excursions were made to Great Cranberry Island, Bass Harbor, the Sea Wall, Sargent Mountain, Flying Mountain, and Robinson Mountain. The Mt. Desert region is as well studied as any area of similar size in the state, hence it was not expected that any real additions to the local list would be made, save such species as may have been described since the publication of the Flora of Mt. Desert. In this, however, the Society was most agreeably disappointed, and the following species are believed to represent real additions to the flora of the island. I am indebted to Mr. Ora W. Knight for the determination of the Carices.

Carex Bebbii Olney.
" *lurida* Wahl., var. *gracilis* Bailey.
" *scoparia* Schkuhr, var. *condensa* Fernald.
" *vesicaria* L., var. *monile* Fernald.
Vicia tetrasperma L.
Echinospermum Lappula Lehm.
Campanula uliginosa Rydb.

A list of the plants seen or collected during the meeting, containing stations for the rarer species, will soon be issued as Bulletin 2 of the Society.— EDWARD B. CHAMBERLAIN, Cumberland Center, Maine.

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THE THREE ADVENTIVE HEATHS OF NANTUCKET, MASSACHUSETTS.

MARIA L. OWEN.

ON the island of Nantucket are three small heaths which attract a degree of attention quite disproportionate to their size. Botanists look at one and question "How came you here?" Flower lovers admiring all of them are content to say "The self-same power that brought me here brought you." Then the Athenians of our day who spend their time seeking new things wherever they journey, hearing of our plant that grows nowhere else on this continent from Greenland to Cape Horn, rush out to the commons to see it; they may be disappointed at its modest appearance, still they show that they too, in their way, care for the wonder, and for all these pilgrims the following story is written.

Erica cinerea, L., *Erica tetralix*, L. and *Calluna vulgaris*, Salisb. are the three heaths, all common and abundant in Northern Europe; the interest lies in the fact that they appear on the Western Continent. Their family is well represented here, but of the genera to which these few specimens belong, *Erica* is totally lacking, and of *Calluna*, although it appears in a few localities quickly counted, it is not certain that it is indigenous with us.

There are three heaths on the island, but it is *Erica cinerea*, the bell-heather, that is the Jean Paul of the trio,— "The Only-One". In August, 1868, a single plant of this species was detected in Nantucket by Mrs. Elizabeth E. Atwater of Chicago, and a notice of this in Wood's Manual of 1874 met my eye. I could hardly believe what I read, but after satisfying myself that there were in the Gray Herbarium specimens verifying Prof. Wood's statement, I took steps to

find the plant again. The island is my birthplace, and I have known its commons, its swamps and thickets, its sea beaches and its pond shores from childhood, but not living there in 1874 I wrote to Mrs. Matthew Starbuck and asked her to be on the lookout for this heather. She is a lady fond of our wild flowers and with facilities for collecting them, but the island has an area of some fifty square miles, and we had no clew to the locality where Mrs. Atwater made her happy find, so it is not strange that years passed before the plant was seen by Nantucket eyes.

I learned in 1879 that Mrs. T. E. Morris, of Saginaw, Michigan, saw it for the second time in 1871. She was Mr. Atwater's niece and was with her uncle and aunt when the plant was first found. In a letter to Mrs. Atwater she tells of visiting again the spot where they had seen it together, of finding "the same old roots" and of searching the vicinity in vain for more specimens. She says "roots"; that is misleading, for there was only one plant, as I know from seeing it many times, year after year.

In 1878 Mrs. Starbuck's daughter, Mrs. Merriam (afterwards Mrs. Spinney), brought home from a walk and showed her mother "a new flower" which the latter declared at once must be the one I had charged her to seek. She was right; the long-hidden heath was rediscovered.

The next time I went to Nantucket I was taken to see the precious plant. It was seven or eight inches high and a bushy little thing, full of flowers; its habit always was to bloom from early summer till late in the fall, and on that account it was conspicuous, but it was fortunately screened from observation by bushes growing between it and the road, and furthermore the bitter polygala, which matches the bell-heather closely in color, was abundant in the vicinity. This plant lived till about 1903, thirty-five years after Mrs. Atwater first saw it. Mrs. Stokeley Morgan, who had known it for several years before its death, tells me that she found it alive and vigorous in the late fall either of 1902 or 1903 and protected it by blocks and boughs; the next spring it was dead, perhaps killed by some heavy thing (part of the protection) which had fallen upon it, or perhaps it had lived its life. And so our fair flower went in mystery as it came. But some time before this Mrs. Morgan had found a second plant not far from the original, and after that was dead she took Judge Churchill of Dorchester to see the new one. He remarked that if the first

had ever ripened seed the prevailing wind at that place would blow it in amongst the trees; they searched at once and were rewarded by the discovery of another plant of the size and apparent age of Mrs. Morgan's first find. This was in 1903 or 1904, and till this year there was no question but they were the direct offspring of Mrs. Atwater's plant; what new testimony has come out will be told farther on. These new plants are in fine condition: I have seen them this year as well as in the two years preceding.

When we consider the eminent botanists who have gone to Nantucket from the time of Oakes and Hitchcock down to the present day and have made diligent collections without ever discovering an *Erica*, it may be confidently inferred that the first specimen could not have been there many years before 1868, but that more may be found is not impossible, for persistent efforts have been made to raise the plant by scattering seed at random and also sowing it in many places.

Mr. Sidney Starbuck told me that he once brought from Scotland two or three pounds of both purple and white heather seed and gave it to his aunt, the Mrs. Starbuck before mentioned, and that she had it sown on the commons.

Mr. John Appleton tells me that the late Mr. Kimball, a well known seedsman and florist of Rochester, N. Y., who had a summer residence on the island for many years, once carried there a bushel of heather seed, with which he supplied those who wanted it until it was nearly all gone and then gave him the remainder which he sowed. Mrs. Dahlgren who spent many summers with her family at their house on the Cliff was so bent on multiplying these additions to the island flora that she procured from a florist directions for propagating heather, and by following them on her own premises with constant care, she raised all three kinds,— the bell-heather, the cross-leaved and the *Calluna* or ling. I saw them once,— tiny little things in two-inch pots, perhaps thirty or more. She gave the plants away generously; I had two myself, but they soon died, and there may not be one living now. I should add that Mrs. Dahlgren, like others already mentioned, took unwearied pains to propagate this pretty heather out of town, with the ultimate object of naturalizing it on the island. On her drives she carried in her lap an uncovered box of seed which she scattered along the roadside, and also had her driver sow some carefully in favorable spots amongst the pines and on the commons.

Miss Lydia M. Folger tells me this year that she was with Mrs. Dahlgren once when she set out plants in just about the spots where Mrs. Morgan found the two now living. This raises the question whether these are really from wind-blown seed or are those of Mrs. Dahlgren's that have lived and flourished. The only thing apparently certain is that they are not to be classed with Mrs. Atwater's discovery. Mrs. Morris searched the vicinity in 1871, and others have done the same year after year, but all in vain till the two specimens now growing near the plant of 1868 appeared; as to the origin of that all are free to form a conjecture, or to call it a waif and there let it rest.

There is no mystery about *Erica tetralix* and *Calluna vulgaris*, found in Mr. Henry Coffin's nursery. It is only this year that I learned the true history of the trees there. I had been told before this that Mr. Coffin, owning unimproved land, exchanged some of it with Mr. George B. Emerson for an equivalent in trees; this is not quite correct, but we are not concerned now with the way Mr. Emerson acquired property in Nantucket. I have at hand a copy of a letter written in April, 1877, by Mr. Coffin to Mr. J. S. Tewksbury of Winthrop, who was Mr. Emerson's agent in the business. He reports in it the arrival of a box of young trees and says that he had at the time of writing finished planting, with the help of three or four men, the six acres of Mr. Emerson's land, and was now going to plant six acres for himself. He was to have twenty thousand two year old trees consigned to him and ten thousand one year old, but apparently they had not all reached him then. He goes on to speak of "the first three boxes which came from Europe, and they contained only 7253 trees, said to be 10,000. They were the fir trees and so were much larger."

This letter proves what had been guessed for many years,— that some, if not all, of the trees were imported stock; we know now that 7253 crossed the ocean to us, quite enough to account for the heaths that sprang up in the nursery. The *Erica* was found there in 1884 by Miss Susan Coffin and the *Calluna* in 1886 by Mr. Lawrence Coffin, but the size of the Callunas showed that they must have been there in 1884, although not distinguished by Miss Coffin and her father. Mr. Lawrence Coffin recognized this heath from his previous familiarity with its appearance. Six years before, while still a schoolboy, he had found a single specimen of *Calluna* on the open com-

mon, a plant that could have had no connection with those of the nursery from which it was miles away. This 1880 plant evidently belongs with those scattered specimens found from time to time in our country from Newfoundland to Massachusetts.

Either in 1886 or soon after, the late Mr. John H. Redfield went to Nantucket expressly to see the three heaths of which he had heard from his friend Dr. Asa Gray. After visiting those to which this paper refers, Mr. Lawrence Coffin took him to see the one which he had found so long before. Mr. Redfield wrote to me that the size of the stock and general appearance of this solitary plant indicated a very considerable age. It disappeared years ago.

As for the future of our immigrants, the two bell-heather plants seem likely to live out their natural lives and the ling (*Calluna*) may become naturalized in a few spots. In 1907 I went to see every individual plant of all three of the heaths of which Mr. John Appleton had any knowledge, and he is well informed about their localities. I found the Calluna quite widely spread. There is a fine large plant raised from a cutting, carefully cherished in a yard in the heart of the town, and Mr. Appleton has two equally large on his farm transplanted from land of his own adjoining the Coffin nursery, while in the nursery itself there may be from twelve to twenty,— I could not easily count them. A few neglected straggling specimens are still to be found amongst the grass on the Dahlgren place.

Mr. Abajian has attempted propagation and he showed me a few minute specimens in his window box; this was in 1906, but they were gone in 1907. A "cliff-dweller" took me to two beautiful plants on the face of the Cliff set out there a few years before, now large and healthy bushes;— this because I was trustworthy, so I say no more of that locality.

Next a most interesting patch far along on the Cliff. Within a space measuring twelve feet by six, there are, by actual count, about fifty vigorous little plants, some hardly above the ground, and others from that size up to three or four inches in height, some in bloom.

These are puzzlers. I might think they were from seed, but who sowed it? Dr. and Mrs. Workman own the place, but they left Nantucket for the Himalayas years ago, and their house has been closed ever since. The few who know of this interesting cluster lay it to Mrs. Dahlgren's agency,— really a probable conjecture,— her cottage was not far from Monsalvat, the Workman place — and although

she has not been on the island for five years, these little plants may be older than we think; we cannot set up as judges of the age of plants which we in this country have never had a chance of studying. It would be absurd to suppose they were natives of the soil and had shown themselves only in these late years. When I saw these pretty little things so stout and healthy amongst the grass, I felt that the Scotch ling had settled there to stay; it thrives in our climate, and in time the slope may be covered with it, at the right season all aglow with its rosy flowers.

In August of this year I heard of two *Callunas* discovered in a new locality by Dr. E. Le Roy Thomson of New Haven, Ct., and under his guidance I went to see them. They are a few feet apart on the open common, growing amongst the usual vegetation of the locality; the largest spreads from one root about three feet six inches by two feet nine, the other, nearly circular, is about three feet in diameter. Dr. Thomson first observed them in July, 1906, while on one of his frequent rides over the island and has seen them every year since; from their rate of growth, which is more rapid than that of the Coffin plants, he judges that they may be from eight to ten years old. They are miles away from any human habitation as well as from the nursery; it seems improbable that they can have sprung from wind-wafted seed of the Henry Coffin plants, but are more likely to be of the Starbuck, Kimball or Dahlgren sowing, and this will be the most plausible explanation for the appearance of any that may be discovered hereafter on the island.

In September of this year Dr. Thomson found still another *Calluna* on the open common, but far from the two just mentioned as well as from the nursery. This is a large plant, about three feet in diameter.

The cross-leaved heather, *E. tetralix*, has diminished sadly in numbers since 1887 when Miss Coffin found some twenty-five plants, more than twice as many as in 1884. It is very attractive with its head of delicate pink blossoms, and by the reckless picking of some of its admirers it is too often pulled out of the ground, so that it has been reduced in number to five individuals. This is in the locality by which the road passes, but in the ten acres or more of the Coffin and Emerson nurseries Dr. Thomson has discovered other specimens, eight measuring each from twelve to twenty inches in diameter and eleven small ones. By means of these hidden away in places difficult of access the species may keep its existence.

The sum of these investigations is this: that one plant of *Erica cinerea* which it has been impossible to trace to human agency appeared in Nantucket forty years ago and lived till 1902 or 1903; that there are two of the same species of doubtful origin now alive near the spot where the first was found; that the Lawrence Coffin *Calluna*, now dead, in all probability adds one more locality for this as a wild plant to those previously known in New England and the British provinces; that the *Calluna* of the nursery came in from Europe with the imported trees; that every other bit of it on the island goes back to that for its origin, or else has come from the Kimball, Dahlgren or Starbuck seed, and that the cross-leaved heather, *Erica tetralix*, stays under the pines and larches where it was first found.

Brooklyn, N. Y.

ADDITIONAL LISTS OF CONNECTICUT DIATOMS.

William A. Terry.

During the past year I sent to Tempère at his request some fifty different gatherings of North American diatoms. He was about to issue the second edition of the "Diatomeés du monde entier" [1] and I was pleased at the opportunity of bringing these collections to the notice of the scientific world, especially as many of them contained new species that I had discovered. Among these gatherings was one from "Doer's Mountain Grove" Ice pond, on a small mountain brook near New Britain reservoir. This was notable as containing abundance of *Surirella Terryi* Ward. This *Surirella* was the principal form in Spring's Pond, a small pond on the north bank of the Pequaback River in Bristol, and with it were numbers of the small *S. ovalis* var. *angusta* (Kütz.) V. H. A quarter mile down the river just east of Saw Shop is a pond hole on the Lee property formed by cutting off a bend of the river when the highway was moved to accommodate the railroad; this is also rich in *S. Terryi*. Below this

[1] Diatomées du monde entier. Collection Tempère et Peragallo. Deuxième Édition. 1907–1908.

is Downs' Pond, a large part of which is a cove setting back from the river, in which the mud is three or four feet deep, all very rich in diatoms, including abundance of the species in question, which is abundant also in Thompson's Pond, on the headwaters of a small brook flowing into Downs' Pond, and Allen's Pond in Stafford district, near the northeast corner of Bristol, on the headwaters of a small stream, and Beattie's Pond, at Leete's Island. At this last station are also other rare species, including *Navicula peripunctata* Brun, *Pleurosigma simile* Grun., and the very rare *P. subsalinum* Per. Outside these ponds above noted I have never found more than an occasional specimen of *S. Terryi* in all the hundreds of gatherings by myself and others from streams, ponds, lakes and rivers all over the country. Of the seven ponds in which this species is found, four are on the headwaters of streams many miles apart, but all in Connecticut, while the others are on the Pequaback River.

The following lists from the third and fourth fascicles of the Diatomées du monde entier are from my material and are interesting as being the latest and most authoritative determinations; many species here given were not in my list[1] and some of them have never before been credited to North America. In spelling, abbreviations and italics, the original is followed; the explanation as there given is — "Nota. Le nom des espèces prédominantes sont imprimés en caractère gras; les rares en italique et les autres en caractère courant."

The Fall Mountain gathering was from a small brook flowing from a mountain spring; Bunnell's Pond is the highest in a series of ponds on a stream flowing from South Mountain reservoir.

No. 78. Ice Pond, New Britain, (Connecticut, U. S. A.).

Achnanthes coarctata Grun.
Amphora libyca Ehr.
ovalis Ktz.
pediculus Ehr.
Cymbella amphicephala Naeg.
Ehrenbergii Ktz.
gastroides Ktz.
naviculaeformis Auers.
Encyonema lunatum Grun.
Epithemia argus v. amphicephala Grun.
gibba Ktz.
v. ventricosa Ktz.
zebra v. proboscida Grun.
Eunotia *diodon Eh. fa. minor.*
impressa Grun.

[1] Rhodora, Vol. IX, p. 125.

Eunotia lunaris Grun.
major Rab.
v. *ventricosa* Cl.
monodon Eh.
pectinalis Rab.
v. ventricosa Grun.
praerupta v. bidens Grun.
ternaria Eh.
Fragilaria *virescens Ralfs.*
Gomphonema acuminatum Eh.
dichotomum W. Sm.
intricatum Ktz.
montanum Shum.
montanum v. suecica Grun.
Hantzschia amphioxys Grun.
elongata Grun.
Meridion *constrictum Ralfs.*
Navicula acrosphaeria Bréb.
affinis Ktz.
amphirynchus Eh.
bicapitata v. hybrida Grun.
Braunii Grun.
v. interrupta.
Brebissonii Ktz.
cryptocephala Ktz.
cuspidata Ktz.
dubia Greg.
gigas Ehr.
iridis Eh.
limosa Ktz.
v. subundulata.
major Ktz.
Navicula mesogongyla v. interrupta Cl.
mesolepta v. stauroneiformis Gr.
mesotyla Eh. var.
nobilis Ktz.
nodosa v. curta Rab.
pupula v. lineare v. n. avec la striation de N. pupula et la forme bacillaire à extrémités arrondies M. P.
trinodis Lewis.
var.
viridis Ktz.
v. commutata Grun.
Nitzschia sigmoidea W. Sm.
Stauroneis anceps Eh.
v. linearis Eh.
gracilis Eh.
legumen Ktz. La forme représentée dans V. H. Syn. 4/11 n'en est qu'une variété très étroite.
Surirella saxonica Auersw.
splendida Eh.
tenera v. splendidula A.S.
Terryi Ward n. sp.
Synedra *capitata Eh.*
ulna Eh.
Van Heurckia rhomboides v. amphipleuroides Grun.

Nos. 103, 104. Fall Mountain, Bristol, Connecticut no. 1 (Etats-Unis).

(Sources et ruisseaux à 800 pieds d'altitude).

Achnanthes lanceolata Bréb.
v. Haynaldii?
Cymbella gastroides Ktz.
Diatoma anceps v. capitata M. Per. à extrémités resserrées et fortement capitées.

Diatoma anceps v. linearis M. Per. trés étroite, lineare à extrémités atténuées.
hyemale fa curta.
var.mesodon Grun.
Encyonema ventricosum Grun.
Eunotia *arcus Eh. v. minor V. H.*
v. tenella Grun.
minor Rab.
pectinalis v. stricta Rab.
Fragilaria *aequalis v. producta* Lag.
Gomphonema angustatum Ktz.
angustatum v. elongata M. Per. plus long que le type, biconique à extrémités à peine un peu produites. Longueur 60 μ.
angustatum v. producta P. P.
dichotomum W. Sm.
micropus Ktz.
tenellum Ktz.
Hantzschia amphioxys Grun.
fa major Grun.
vivax v. granulata M. Per. très grand, porte à une certaine distance de la caréne une ligne de points analogues aux points carénaux. Longueur 250 μ. 13 stries en 10 μ.
Meridion constrictum fa elongata, très long et étroit.
constrictum v. Zinkenii Grun.
Navicula acrosphaeria v. minor M. Per. et F. H.
appendiculata Ktz.
Navicula bisulcata Lag.
Bogotensis v. ininterrupta M. P. à striation non interrompue au milieu de la valve.
Bogotensis v. undulata M. Per. diffère de A. S. 44/30 par les bords triondulés.
Cari Eh. v. angusta Grun.
decurrens Eh.
dicephala Eh.
dicephala v. lata M. Per. largement elliptique, rostrée, capitée et striation du *Nav. dicephala*.
divergens W. Sm.
elegantissima M. Per. Petite, largement elliptique à extrémités rostrées, capitées; structure formée de granules fines disposées en élégantes lignes courtes décussées comme chez les Orthoneis.
elliptica Ktz.
fasciata Lag.
gibba Ktz.
hemiptera Ktz.
heroina A. S.
major Ktz.
parva Eh.
Smithii v. dilatata M. Per. fortement dilatée, presque circulaire; aire centrale développée, côtes fines et isolées, peu distinctement granulées.
stomatophora Grun.
subcapitata v. stauroneiformis.

Navicula viridis Ktz.
v. commutata Grun.
v. fallax Cl.
Pleurosigma *attenuatum W. Sm.*
Stauroneis anceps Eh.
v. linearis.
anceps v. capitata M. Per. Semblable à la variété amphicephala mais plus petit, à bords droits et à extrémités relativement plus larges et plus capitées. Long 22 μ largeur 7 μ.
Synedra ulna Eh.
v. vitraea V. H.
Tabellaria fenestrata Ktz.
flocculosa Ktz.
v. ventricosa Grun.
Van Heurckia vulgaris Thw.

No. 105, 106. Bunnel's Pond, Bristol, Connecticut (Etats-Unis) (Dépôt fossile d'eau douce).

Amphora Lybica Eh.
pediculus Grun.
Cocconeis placentula Eh.
v. lineata V. H.
Cymbella cuspitata Ktz.
Ehrenbergii v. minor V. H.
gastroides Ktz.
heteropleura Ktz.
producta M. Per. De forme élliptique, à extrémités productes, semblable à celle figurée dans A. S. atlas 9/52 mais plus grande à aire centrale plus développée et stries distinctement divisées en travers. Long 74 μ; 7 stries dorsales, 8, 5 ventrales en 10 μ.
Encyonema ventricosum Ktz.
Epithemia *turgida Ktz.*
Zebra Ktz.
Eunotia arcus Eh.
v. plicata J. B. et F. H.
diodon Eh.
fa. minor Grun.
formica Eh.
Eunotia *gracilis v. nodosa?* les extrémités sont rondes, différentes de celles de *E. formica.*
incisa Greg.
lunaris Grun.
monodon Eh.
pectinalis v. ventricosa Grun.
praerupta Eh.
robusta v. tetraodon V. H.
Fragilaria Harrissonii Grun.
virescens Ralfs.
Gomphonema acuminatum Eh.
angustatum Ktz.
augur Eh.
commutatum Grun.
constrictum v. capitata Eh.
constrictum v. subcapitata Eh.
Herculaneum Eh.
micropus Ktz.
Mastogloia **Smithii** *Thw. var.*
Meridion constrictum Ralfs.
Navicula acrosphaeria Ktz.
acrosphaeria var. dilatata M. Per. à centre très

fortement dilaté en forme de cercle et à extrémités capitées.
affinis v. amphirynchus Eh.
Navicula affinis fa. maxima.
americana v. bacillaris M. P. et F. H.
amphigomphus Eh.
bisulcata Lag.
Bogotensis Grun. var.
brevicostata Eh.
commutata Grun.
dactylus fa. curta Ktz.
Dariana A. S.
divergens W. Sm.
divergens v. bacillaris M. Per. tout à fait bacillaire à extrémités exactement hémicirculaires.
divergens v. constricta M. Per. à partie ventrale resserrée et à extrémités atténuées arrondies.
elegantissima M. Per.
fasciata Lag.
gentilis Donk.
gibba Eh.
Hitchcockii Eh.
iridis Eh.
legumen Eh.
limosa Ktz.
linearis Greg.
major Ktz.
mesolepta v. stauroneiformis Grun.
mesostyla Ktz.
nobilis Eh.
rhyncocephala Ktz.
rupestris Hantz.
transversa A. S.
viridis Ktz.

Navicula sp. A. S. atlas 44/44.
sp. A. S. atlas 49/40. (N. producta v. acuta.)
Nitzschia spectabilis Ralfs.
Stauroneis acuta W. Sm.
v. gracilis Eh.
gracilis Eh.
lanceolata Ktz.
Phoenicenteron Eh.
Pteroidea Eh.
Stephanodiscus astraea Grun.
Surirella **Guatemalensis** Eh. = Sm.
Cardinalis Kitt.
Kittoni? A. S. v. elliptica.
linearis W. Sm.
v. constricta Grun.
pseudo cruciata M. Per., de structure tout à fait semblable à celle de A. S. 56/15, 16 mais ne présentant pas le renforcement de la partie centrale.
splendida Eh.
tenera Greg.
v. nervosa A. S.
v. splendidula A. S.
valida A. S.
Synedra splendens Ktz.
ulna Eh.
v. lanceolata fa brevis Grun.
v. undulata Greg.
Tabellaria fenestrata Ktz.
flocculosa Ktz.
flocculosa v. ventricosa Grun.
Van Heurckia rhomboides Bréb.
rhomboides v. amphipleuroides Grun.
vulgaris Thw.

Bristol, Connecticut.

NOTES ON NEW ENGLAND HEPATICAE, — VI.

ALEXANDER W. EVANS.

DURING the past year several important additions have been made to the hepatic flora of New England, more especially to the local floras of Maine, New Hampshire, and Connecticut. These additions are recorded in the present paper, although a number of them have already been noted in earlier publications.[1] The synonymy of six other New England species is also briefly discussed.

1. METZGERIA PUBESCENS (Schrank) Raddi, Mem. Soc. Ital. delle Sci. in Modena **18**: 46. 1818. *Jungermannia pubescens* Schrank, Prim. Fl. Salisb. 231. 1792. *J. tomentosa* Hoffm. Deutschlands Flora **2**: 91. 1795. *Echinomitrium pubescens* Hüben. Hepat. Germ. 48. 1834. On bark of yellow birch, near base of tree. Franconia Notch, New Hampshire (*Miss Haynes*). The species is most frequently found on limestone rocks. It has a wide distribution in Europe and Asia and is not uncommon along the Pacific Coast of North America from Alaska to Washington. It has also been reported from eastern North America, but the records are indefinite and the specimens upon which they are based seem to have disappeared. The plants collected by Miss Haynes are fragmentary and mixed with *M. conjugata*, but there seems to be no doubt as to the correctness of the determination. *M. pubescens* is at once distinguished from our other species by the fact that the upper or antical surface of the thallus is densely covered with hairs, which give it a velvety appearance. In well-developed plants the midrib is bounded both above and below by from eight to ten rows of cells, although the number is frequently less on slender branches. There is also but little difference in size between these cortical cells and those which form the interior of the midrib. In *M. conjugata* and the other species known from the United States the upper surface of the thallus is smooth, and the midrib is bounded above by only two rows of cells and below by from two to four rows. There is also a sharp distinction in size between the large cortical cells and those in the interior of the midrib. *M. pubescens* is further distinguished by its pinnate rather than dichotomous

[1] Collins: Some Mosses from Aroostook County, Maine. RHODORA **10**: 37, 38. 1908. Evans & Nichols: The Bryophytes of Connecticut. Conn. Geol. and Nat. Hist. Survey **11**: 1-203. 1908. Miss Lorenz: Jungermannia in New Hampshire. Torreya **8**: 55, 56. 1908.

branching, a peculiarity which is not always evident on poorly developed material.

2. **Marsupella robusta** (DeNot.) comb. nov. *Jungermannia emarginata*, var. *aquatica* Lindenb. 1829. *Sarcoscyphus Ehrharti*, var. *aquaticus* Nees, 1833. *S. Ehrharti*, var. *robustus* DeNot. 1861. *Nardia robusta* Lindb.; Carrington, Brit. Hep. 16. 1874 (incidental mention). *N. robusta* Trevis. 1877. *S. aquaticus* Breidl. 1894. *Marsupella aquatica* Schiffn. 1896.[1] The strict application of either the Vienna Rules or the American Association Code of Nomenclature necessitates the above change. Although Lindenberg's variety *aquatica* is so much older than the variety *robustus* of DeNotaris, it was under the latter name that the species was first adequately published by Trevisan. As the synonymy shows the name *Nardia robusta* had already been used for the present species by Lindberg,[2] but he apparently never published it and we know it only from the incidental mention in Carrington's work. *Marsupella robusta* is still known in New England from Maine and New Hampshire only.

3. Nardia crenuliformis (Aust.) Lindb. Acta Soc. Sci. Fenn. **10**: 530. 1875. *Jungermannia crenuliformis* Aust. Bull. Torrey Club **3**: 10. 1872. *Solenostoma crenuliforme* Steph. Bull. de l'Herb. Boissier II. **1**: 494. 1901. On rocks along a stream. Beacon Falls, Connecticut (*A. W. E.*). New to New England. The species is apparently confined to the eastern United States, but its range is very indefinitely known, the only stations recorded being the following: Closter, New Jersey (*Austin*); Coschocton County, Ohio (*Sullivant*); Tibb's Run, West Virginia (*Andrews*). Even at the time of its original publication Austin recognized its relationship to *N. crenulata*, and Lindberg considered the relationship so close that he was almost ready to deny it specific rank. Austin,[3] however, insisted that it was distinct, and it has recently been recognized as a clearly defined species by both Underwood and Stephani. The most striking peculiarity which the two species possess in common is the border of enlarged and thick-walled cells, which usually forms a conspicuous feature of the leaves and bracts. This border is even more constant in *N. crenuliformis* than in *N. crenulata*, in slender forms of which

[1] For fuller references and additional synonyms see the writer's notes on *M. aquatica* in Rhodora **6**: 167. 1904.

[2] See Schiffner, Lotos **44**: 267. 1901.

[3] Bull. Torrey Club **6**: 85. 1876.

it is often restricted to the uppermost bracts. Even in the borders, however, certain differences are to be observed. In *N. crenulata* the marginal cells lie in the plane of the leaf and are considerably larger than the cells just within; in *N. crenuliformis* they lie in a different plane and form an elevated ridge around the leaf, but the contrast in size is less marked. The remaining leaf-cells also show differential characters: in *N. crenulata* they average about 35 μ in the middle of the leaf, and their walls are either thin throughout or show minute trigones; in *N. crenuliformis* the median cells average about 25 μ and show distinct trigones. *N. crenuliformis* is further distinguished by its place of growth (*N. crenulata* preferring sandy banks and roadsides), by its numerous flagella, and by its reddish rhizoids. The last peculiarity indicates an approach to *N. hyalina* and *N. obovata*, both of which show a uniform cell-structure in their leaves.

4. Lophozia attenuata (Mart.) Dumort. Recueil d'Obs. sur les Jung. 17. 1835. *Jungermannia gracilis* Schleich. Pl. Crypt. Exsic. Helvet. **3**: *60.* 1804 (*nomen nudum*); Lindberg, Musc. Scand. 7. 1879. *J. quinquedentata δ attenuata* Mart. Fl. Crypt. Erlangensis 177. *pl. 6, f. 50c.* 1817. *J. attenuata* Lindenb. Nova Acta Caes. Leop.-Carol. **14**, suppl.: 48. 1829. *J. quinquedentata β gracilis* Hüben. Hepat. Germ. 203. 1834. *J. barbata*, var. *attenuata* Nees, Naturgeschichte der europ. Leberm. **2**: 163. 1836. *Lophozia gracilis* Steph. Bull. de l'Herb. Boissier II. **2**: 47. 1902. *Barbilophozia attenuata* Loeske, Verhandl. Bot. Ver. Prov. Brandenburg **49**: 37. 1907. According to the prevailing codes of nomenclature *Jungermannia gracilis* of Schleicher was not adequately published by its author. The name first appeared in a set of exsiccatae of Swiss cryptogams, issued early in the last century. The specimens were distributed with printed labels, but no diagnoses accompanied the species which Schleicher considered undescribed. The names of these new species are therefore to be regarded as *nomina nuda*, unless subsequent authors have republished them either with descriptions or with the citation of synonyms. In the case of *J. alpestris* Schleich. this was soon done by Friedrich Weber,[1] so that this name is now universally recognized. In the case of *J. gracilis*, however, adequate publication was delayed for many years, although

[1] Hist. Musc. Hepat. Prodr. 80. 1815.

the name was quoted from time to time in synonymy. Meanwhile the species which Schleicher called *J. gracilis* was published as new by Lindenberg under the name *J. attenuata*, and it is by this specific name that it ought now to be designated. *L. attenuata* is known in New England from Maine, New Hampshire, Vermont, and Connecticut, and ought surely to be expected in Massachusetts.

5. Lophozia Baueriana Schiffn. Lotos **51**: (9). 1903. *Jungermannia barbata*, var. *pusilla* Schiffn.; Schiffner & Schmidt, Lotos **35**: 25. 1886. *Lophozia Floerkii*, var. *Baueriana* Schiffn. Oesterr. Bot. Zeitschr. **50**: 274. 1900. *J. Floerkii*, var. *aculeata* Loeske, Moosfl. des Harzes 86. 1903. On wet rocks. Little Saddleback Mountain, Franklin County, Maine (*Chamberlain & Knowlton*). New to New England but recently recorded from arctic America (Greenland, Ellesmere Land, and North Lincoln) by Bryhn.[1] *L. Baueriana* was proposed by Schiffner to include plants which were formerly considered connecting links between *L. Floerkii* and *L. lycopodioides*. Although so recently published it has already received wide acceptance in Europe, where it has an extensive distribution. It agrees with its nearest allies in having distinct underleaves and in developing a cluster of teeth or cilia near the postical base of each leaf. It differs from *L. Floerkii* in the fact that its leaves usually have four lobes instead of three, some of the lobes at least being tipped with bristle-like teeth, instead of being uniformly blunt. These peculiarities it shares with *L. lycopodioides*, but the latter species is distinguished by its larger size and by its crispate leaves commonly broader than long. *L. Baueriana* is further characterized by producing an abundance of gemmae, these bodies being very rare in most species of the *barbata*-group. Another very close relative is *L. Hatcheri* (Evans) Steph.,[2] of antarctic regions, a species which also reproduces itself largely by means of gemmae. According to Loeske the two species are probably synonymous, and he unites them under the name *Barbilophozia Hatcheri* Loeske.[3] In view, however, of their wide geographical separation it seems quite justifiable to keep them apart until their ranges of variability are better known, more especially since no species of the *barbata*-group are known from intermediate regions. For fur-

[1] Rep. Second Norwegian Arctic Exped. in the "Fram" **11**: 37. 1906.

[2] Bull. de l'Herb. Boissier II. **2**: 159. 1902. *Jungermannia Hatcheri* Evans, Bull. Torrey Club **25**: 417. *pl. 346, f. 1–7.* 1898

[3] Verhandl. Bot. Ver. Prov. Brandenburg **49**: 37. 1907.

ther information about *L. Baueriana* the following references may be consulted: Arnell, Bot. Notiser 1906: 145–157. Arnell & Jensen, Naturw. Unters. des Sarekgebirges in Schwedisch-Lappland **3**: 109. 1907. Macvicar, Jour. Bot. **45**: 258. 1907.

6. LOPHOZIA LONGIFLORA (Nees) Schiffn. Lotos **51**: (45). 1903. *Jungermannia longiflora* Nees, Naturgeschichte der europ. Leberm. **2**: 95. 1836. *L. ventricosa*, var. *longiflora* Macoun, Cat. Canadian Pl. **7**: 17. 1902. In tufts of *Sphagnum*, near Schoodic Lake, Maine (*A. W. E.*). New to New England. Probably widely distributed in North America but easily confused with other species of the *ventricosa*-group. Until revived by Schiffner the species had long been ignored or forgotten by the majority of European writers. *L. longiflora* is closely related to *L. porphyroleuca* and perhaps represents a swamp or bog variety of that species, although Schiffner states that he has never seen connecting forms. When compared with typical *L. porphyroleuca*, which grows on rotten logs, *L. longiflora* is seen to be about three times as large, the difference in size being especially apparent in the perianth. As a rule the leaf-cells have smaller trigones, and their walls are sometimes scarcely thickened at all. The mouth of the perianth is not lobed as in *L. porphyroleuca* but simply minutely and irregularly toothed, very much as in *L. ventricosa*. Unfortunately the Maine specimens are destitute of perianths but agree in all other respects with those distributed by Schiffner (Hep. Europaeae Exsic. *138, 139*).

7. **Cephaloziella Sullivantii** (Aust.) comb. nov. *Jungermannia Sullivantii* Aust. Proc. Acad. Philadelphia for 1869: 221. *Cephalozia Sullivantii* Aust. Hep. Bor.-Amer. *50*. 1873. The genus *Cephaloziella* was first proposed by Spruce[1] as a subgenus under *Cephalozia* and afterwards raised to generic rank by Schiffner.[2] It is not universally accepted, even in Europe, and yet the species which belong to it form a group which can be easily distinguished. They are considerably smaller than in *Cephalozia* (subgenus *Eucephalozia* Spruce), their leaf-cells also are smaller, and their female flowers are usually borne on leading branches rather than on short postical branches. The cell-structure of the stems and branches is also characterized by being uniform, while in *Cephalozia* a cortical layer of enlarged cells is usually differentiated. The perianth in *Cephaloziella*, finally,

[1] On Cephalozia 62. 1882.
[2] Engler & Prantl, Nat. Pflanzenfam. **1**[3]: 98. 1895.

commonly bears several supplementary keels in addition to the three keels characteristic of the Trigonantheae as a whole. These peculiarities afford an excellent combination of generic characters, although it must be admitted that some of them are not invariably constant. In addition to the species noted above, *Cephaloziella divaricata* (Sm.) Schiffn. and *C. myriantha* (Lindb.) Schiffn. are also known from New England.[1] It is also probable that the number of species would be still further increased if the material on hand were thoroughly revised.

8. Bazzania tricrenata (Wahl.) Trevis. Mem. R. Ist. Lomb. III. **4**: 415. 1877. *Jungermannia triangularis* Schleich. Pl. Crypt. Exsic. Helvet. **2**: *61*. 1803 (*nomen nudum*). *J. tricrenata* Wahl. Fl. Carpat. 364. 1814. *J. deflexa* Mart. Fl. Crypt. Erlangensis 135. *pl. 3, f. 8*. 1817. *Pleuroschisma tricrenatum* Dumort. Syll. Jung. 70. 1831. *P. deflexum* Dumort. l. c. 71. *Herpetium deflexum* Nees, Naturgeschichte der europ. Leberm. **3**: 59. 1836. *Mastigobryum denudatum* Torrey; G. L. & N. Syn. Hep. 216. 1845. *M. ambiguum* Lindenb. l. c. 217. *M. deflexum* Nees, l. c. 231. *Bazzania triangularis* Lindb. Acta Soc. Sci. Fenn. **10**: 499. 1875. *B. deflexa* Underw. Bull. Ill. State Lab. Nat. Hist. **2**: 83. 1884. The same reasoning which applies to *Lophozia attenuata* applies to *Bazzania tricrenata* as well. Schleicher's *Jungermannia triangularis*, inadequately published as a *nomen nudum*, ought to be superseded by the adequately published *J. tricrenata* of Wahlenberg. The synonymy of the species is exceedingly complicated, and only the more important of its many names are indicated above. It is usually abundant in mountainous and northern regions and is known in New England from New Hampshire, Vermont, Massachusetts, and Connecticut. Strangely enough it has not yet been reported from Maine.

9. Leucolejeunea clypeata (Schwein.) Evans, Torreya **7**: 227. 1908. *Jungermannia clypeata* Schwein. 1821. *Lejeunea clypeata* Sulliv. 1848. *Archilejeunea clypeata* Schiffn. 1895. This species is known from Massachusetts and from numerous localities in Connecticut. It should also be looked for in Vermont, since it has already been found on the eastern shore of Lake George, New York.

10. Leucolejeunea unciloba (Lindenb.) Evans, Torreya **7**: 228. 1908. *Lejeunea unciloba* Lindenb. 1845. *Archilejeunea unciloba* Steph. 1895. *A. Sellowiana* Steph. 1895. The only known

[1] See Evans, Rhodora **7**: 55. 1905.

New England station for this species is Quidquisset, Rhode Island (*Bennett*). It probably reaches its northern limit in southern New England, but its range extends southward into Brazil. The reasons for separating this and the preceding species from *Archilejeunea* are fully stated by the writer in Torreya **7**: 225–229. 1908. The same paper also calls attention to the fact that *Archilejeunea Sellowiana* Steph. must be considered a synonym of *Lejeunea unciloba* Lindenb. For descriptions and figures of *L. clypeata* and *L. unciloba*, see Evans, Mem. Torrey Club **8**: 122–128. *pl. 16*. 1902.

11. FRULLANIA SELWYNIANA Pears. List of Canadian Hepat. 1. *pl. 1*. 1890. Evans, Trans. Conn. Acad. **10**: 29. *pl. 13, f. 10–17*. 1897. *Frullania Sullivantiae* Aust. Bull. Torrey Club **3**: 16. 1872 (not *F. Sullivantii* Aust. 1869). On bark of *Thuja occidentalis*. Shores of Schoodic Lake, Piscataquis Co., Maine (*A. W. E.*). New to New England. The type specimens were collected by Macoun near the mouth of Ste. Anne des Monts River, Gaspé County, Quebec. The species is also known from several localities in Ohio, Austin's specimens of *F. Sullivantiae* having been collected near Urbana. *F. Selwyniana* looks at first sight like a small form of *F. Asagrayana*, resembling it in color and in glossiness. It also agrees in having blunt leaves, each marked by a median row of ocelli or discolored cells. It may be at once distinguished, however, by its autoicous inflorescence and by the fact that the female flower terminates the main stem or a leading branch instead of being borne on a short and simple branch. The coarsely dentate perichaetial bracts are also a striking feature.

12. ANTHOCEROS MACOUNII M. A. Howe, Bull. Torrey Club **25**: 19. *pl. 326, f. 1–9*. 1898. Along a roadside. Mechanics Falls, Androscoggin County, Maine (*J. A. Allen*). This interesting species was based on specimens collected by Macoun at the outlet of Leamy's Lake, near Hull, Quebec, and distributed in Canadian Hepaticae *81*, as *A. punctatus*. It has since been found near Winona, Minnesota, by Holzinger[1] and is now known therefore from three widely separated localities. It agrees with *A. punctatus* in its dark-colored spores but differs, as Howe clearly shows, in its shorter capsules, in its muriculate spores, the roughness extending over both the inner and the outer surfaces, and in its scanty or abortive sterile cells or pseudo-elaters. In *A. punctatus* the spores are echinulate or

[1] Bryologist **10**: 13. 1907.

setose-papillate on the outer surface, while the inner surfaces are simply foveolate-areolate, and the pseudo-elaters are much better developed.

Aside from the species already mentioned in the preceding pages, the following additions may be recorded:—

For Maine. *Riccardia pinguis;* Crystal, Aroostook County (*M. L. Fernald*). *Calypogeia tenuis* and *Jungermannia pumila*; vicinity of Schoodic Lake, Piscataquis Co. (*A. W. E.*). *Lophocolea minor*; Fort Fairfield (*E. B. Chamberlain & J. F. Collins*). *Lophozia bicrenata* and *Marsupella ustulata*; Mount Katahdin (*A. W. E.*). *Porella pinnata* and *Sphenolobus Hellerianus*; vicinity of Schoodic Lake (*A. W. E.*). *Anthoceros punctatus*; Kittery Point (*R. Thaxter*).

For New Hampshire. *Ricciella fluitans*; Sanbornton (*Mrs. Carter*). *R. Sullivantii*; Dalton (*A. S. Pease*). *Calypogeia suecica, C. tenuis, Cephalozia serriflora,* and *Cephaloziella myriatha*; Franconia Mountains.[1] *Jungermannia cordifolia*; Waterville (*Miss Lorenz*). *Lepidozia setacea* and *Lophozia marchica*; Franconia Mountains.[1] *Nardia hyalina*; Waterville (*Miss Lorenz*).

For Massachusetts. *Jubula pennsylvanica*; Melrose (*C. C. Kingman*).

For Rhode Island. *Ptilidium pulcherrimum*; Providence (*J. F. Collins*).

For Connecticut. *Cephaloziella myriantha*; East Granby and West Hartford (*Miss Lorenz*). *Scapania curta*; Meriden (*Miss Lorenz*). *S. dentata*; Burlington (*G. E. Nichols*). *Lophozia ventricosa*; Salisbury (*Miss Lorenz*).

The Maine records for *Pellia epiphylla, Cephalozia pleniceps, C. serriflora, Lepidozia setacea, Lophozia marchica,* and *Scapania irrigua* may now be definitely marked with the sign "+", although most of them are marked in the writer's Preliminary List with the sign "—". The same is true of the New Hampshire record for *Cephalozia pleniceps* and the Rhode Island record for *Lunularia cruciata.* Unfortunately the Rhode Island record for *Frullania Tamarisci* must be erased, since, as Professor Collins notes, it is based on specimens collected at Blackstone, Massachusetts, just across the Rhode Island line. The Massachusetts record for this rare species may therefore be marked with the sign "+".

[1] Collected by a committee of the Sullivant Moss Chapter, consisting of Miss Haynes, Miss Lorenz, Miss Robinson, and the writer. A full report on the collections, by Miss Lorenz, will appear in the Bryologist for November, 1908.

The census of New England Hepaticae now stands as follows: Total number of species recorded, 147; number recorded from Maine, 101; from New Hampshire, 116; from Vermont, 84; from Massachusetts, 82; from Rhode Island, 64; from Connecticut, 107; common to all six states, 43.

YALE UNIVERSITY.

GRAY'S MANUAL OF BOTANY, SEVENTH EDITION.[1]

KARL M. WIEGAND.

PERHAPS it is not too much to say that no work has been awaited with so much interest by botanists as the new edition of Dr. Gray's famous text-book, which is now before us. It has been a long time since the last edition appeared in 1890, and in this age when progress in scientific fields is so rapid it was inevitable that the work should gradually fall behind the times. A new edition brought completely up to date has long been promised us until to the uninitiated it has seemed like a truly elusive will-o-the-wisp. The delay, however, was due solely to the very great amount of labor and time required for a complete revision and verification of the enormous mass of facts contained in the work. For nearly ten years the editors have been engaged at their task, and it is safe to say that the Manual has never before received a more critical revision.

To the botanist who has not followed recent progress in his science, and who is familiar only with the Gray's Manual of the past, this new edition will appear strange indeed. The most striking change lies undoubtedly in the substitution of the newer Eichler or Engler and Prantl system of classification, now so generally adopted everywhere, for the somewhat antiquated Benthamian system previously used. We now find the *Compositae* at the end of the book and the grasses near the beginning. The older botanist will also find unfamiliar the numerous text illustrations inserted on many pages of the work. These illustrations are small in size and are intended to illustrate not the whole plant but certain characters that are difficult to

[1] Gray's New Manual of Botany, 7th ed. Illustrated.— Rearranged and extensively revised by Prof. B. L. Robinson and Prof. M. L. Fernald of the Gray Herbarium (Harvard Univ.)— American Book Co. 1908, pp. 926.

make clear verbally. They seem carefully done and will undoubtedly prove very useful. A third innovation lies in the adoption of the Vienna code of nomenclature throughout the work. This has necessitated a change in many familiar names, but in fewer than would have been the case had a more radical system been adopted. We also find evidence throughout the work of painstaking investigation into the types of the older authors, resulting frequently in the discovery of long-followed error in interpretation. Rectification of such error has also resulted necessarily in some change of names.

The older botanist will also find much evidence of the great activity in taxonomic botany of recent years. Many species are added; others are broken up; while some are united, in accord with recent revision of the various groups. In this however the authors have maintained a conservative attitude, critically reviewing all new propositions, omitting species of doubtful status, and treating as varieties all those forms that freely intergrade. The policy has also been,—when in doubt, leave it as it was.

We note also the introduction of many specific keys under difficult genera. To the reviewer this seems a very commendable feature, but one that might well have been introduced much more freely. The genus *Aster* and the genus *Solidago* show very strikingly this contrast in treatment. Another new feature, also a good one, is the addition of synonymy under each species. This will be especially appreciated by the amateur botanist who has not time to follow all the changes in nomenclature.

The liverworts have been omitted from this edition, but the ferns and their allies are still retained. The plates that were found at the back of the book are also omitted, most of their figures having been redrawn and more conveniently distributed in the text. At the beginning of the book the synopsis of families has been much reduced, and the analytical key has been made to occupy a more prominent place.

Notwithstanding these many innovations the book is still recognizable as a Gray's Manual. Throughout the work the well known "manual" practice of italicising the distinguishing characters has been followed in family, generic, and specific descriptions. Following the family characterization of the larger families we also find the familiar synopsis divided into tribes with the subdivisions marked with the asterisk and the dagger, and we also find the interpolation in the

genus of the familiar text synopsis. In the use of the various kinds of type too an attempt has been made to follow the plan of the previous editions.

The conservative attitude of the authors is also evidenced by the retaining of the old limits in family and genus as opposed to the practice of segregation. The *Compositae*, *Rosaceae*, and *Leguminosae* still retain their old limits; as also do *Pyrus*, *Potentilla*, *Oenothera*, and *Habenaria*.

The familiar glossary is found at the end of the book, and also a specially prepared index. This index includes family, generic, specific, and popular names, as well as synonyms, all in one, and is a specially commendable feature of the work.

The authors have been assisted in the revision by specialists in certain groups. The *Gramineae* have been revised by Prof. A. S. Hitchcock; the *Orchidaceae* by Mr. Oakes Ames; the Genus *Viola* by Pres. Ezra Brainerd; *Equisetum* and *Isoetes* by Mr. A. A. Eaton; *Senecio* by Dr. J. M. Greenman; and *Crataegus* by Mr. W. W. Eggleston.

The area covered by the Manual has been somewhat changed. The range of this edition is from the Atlantic Seaboard to the western boundary of Minnesota and Iowa and south along the 96th meridian; and from the 48th parallel at the east, and the international boundary at the west, southward to the southern boundary of Kansas, Missouri, Kentucky, and Virginia.

The following statistics are interesting,—

6th Ed.	Genera		Species	
	Native	Introd.	Native	Introd.
Monocots.	170	22	721	64
Dicots.	581	106	1908	380
Total	751	128	2629	444
7th Ed.				
Monocots.	184	26	993	92
Dicots.	596	154	2280	571
Total	780	180	3273	663

The press work is of high class and is a credit to the publishers. Especially is this true when the task of condensing 926 pages into a book of convenient size is considered. A leather-covered pocket edition is in press.

As a whole the work is fully up to the standard of Gray's Manuals,

and is a distinct credit to the already well known reputation of the editors.

It is learned from the publishers that the exact date of issue was 18 September, 1908.

Wellesley, Massachusetts.

New Stations for Ferns in Vermont.— The writer had the good fortune to find within a mile from this city in June a swamp containing several hundred plants of *Woodwardia Virginica* (L.) Sm., thus establishing a third station in Vermont for this interesting fern, the others being Fort Ethan Allen pond, near Burlington, and a bog in Franklin. The circumstances under which the *Woodwardia* was growing here are rather interesting. The bog is of the typical sphagnum type, situated between two ledges, at perhaps 700 feet elevation. The hill on which it is found shelters a large pond bordered by a sphagnum bog, evidently a typical place for *Woodwardia*, yet not a plant of the fern is to be found there although it is only a few hundred feet from the new station. Another interesting fern to be found in the Woodwardia bog and one which I have never before seen in Vermont is *Osmunda cinnamomea* var. *incisa*. About half of a large number of plants of this *Osmunda* growing in the bog show well incised pinnae. The effect of these cut pinnae on the general appearance of the frond is very pretty. None of the incised form of *O. cinnamomea* grows in the other bogs on the hill. A number of botanists to whom I have showed the incised form of cinnamon fern expressed the belief that it would not reproduce true to parent but the finding of so many plants of the fern in the bog looks as though it were something more than a freak.— George L. Kirk, Rutland, Vermont.

To collectors and those who possess herbaria within the region covered by Gray's Manual it will be of interest to learn that a Check List of the new (7th) edition has been prepared by Miss Mary A. Day, Librarian of the Gray Herbarium, Cambridge, Massachusetts. It is of pocket size and will be found convenient alike for field notes and exchange records.

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BIDENS CONNATA AND SOME OF ITS AMERICAN ALLIES.

M. L. Fernald.

Bidens connata Muhl.

In September last Mr. C. A. Weatherby and the writer made two visits to the shores of Winter Pond in Winchester, Massachusetts, a station which for generations has furnished New England botanists with local or otherwise remarkable plants. One of the conspicuous plants at that season was a *Bidens* which grew in abundance between the thicket and the sandy beach as well as in the adjacent swampy areas. The primary leaves of the plant were so unusual in their appearance, especially in having toward the base two lobes which were strongly decurrent to the winged petiole, that we gathered material for further study. Later comparison in the herbarium showed it to be a little known plant, represented in the Gray Herbarium only by a specimen collected as unusual by the late Alvah A. Eaton and the writer at Salisbury, Massachusetts, in 1902, and another collected by Professor John Macoun at Ste. Anne de Beaupré, Quebec, in 1905; while the herbarium of the New England Botanical Club has two sheets,— one collected by Mr. W. P. Rich at Spot Pond, Stoneham, Massachusetts, in 1894, the other by Mrs. Clara Imogene Cheney at Centerville, Massachusetts, in 1900. More recently Professor K. M. Wiegand and the writer have revisited the Winter Pond station; and we have found the plant with the lateral lobes of the leaves conspicuously decurrent along the petiole about Lake Waban at Wellesley, Massachusetts. The writer has also seen it in the Fresh Pond marshes in Cambridge. It is probable, then, that this peculiar plant is much

more generally distributed than its representation in the herbaria would indicate. Careful study of the material and comparison of the original description leads to the somewhat surprising conclusion that it is exactly the plant described by Muhlenberg as *Bidens connata*,[1] while the commoner plant with simple slender-petioled leaves which is passing as *B. connata* is ordinarily so distinct as to merit varietal recognition and was even characterized as a species, *B. petiolata*,[2] by Nuttall.

As treated by recent authors *Bidens connata* is supposed to be the plant (Nuttall's *B. petiolata*) with usually simple distinctly petioled leaves, while the occurrence of 3-lobed leaves if noted at all is considered unusual. This is a somewhat natural conclusion, since the herbarium representation of the former is so much more complete than of the latter plant. The two plants in their extreme forms are very different, but the writer has sought in vain for constant characters by which they can be clearly separated.

The surfaces of the achenes at first seemed to offer good concomitant characters; for in some plants with the slender-petioled unlobed leaves the achenes are quite smooth, while in some specimens with the broad-petioled lobed leaves they are tuberculate or warty. This presence or absence of warts on the achene has been much emphasized by European students of the group who, finding about various lakes of continental Europe *B. connata* with warty achenes, maintain that American specimens with smooth achenes cannot belong to the same

[1] "*8. BIDENS *connata*.

B. floribus discoideis, calyce exteriore flore triplo longiore, foliis caulinis ternatis foliolis lateralibus connatis, floralibus oblongo-lanceolatis. W.

Bidens connata. *Muhlenberg.*

Verwachsener Zweyzahn. W.

Habitat in America *boreali.* ⊙ (*v. s.*)

Caulis *laevis ramosus.* Folia *caulina petiolata ternata, foliolis lateralibus oblongis acutis serratis sessilibus, basi inferiore in petiolum decurrentibus, foliolum intermedium petiolatum oblongum utrinque attenuatum serratum.* Folia *floralia et summa ramea petiolata oblonga utrinque attenuata serrata.* Calyx *duplex, exterior pentaphyllus, foliolis lanceolatis flore triplo longioribus; interior foliolis coloratis obtusis margine membranaceis aequalibus. Corolla discoidea. Differt a B. frondosa foliorum forma, calyce exteriore breviore tantum pentaphyllo.* W." — Willd. Sp. iii. 1718 (1804).

[2] "57. BIDENS **petiolata.* Glabra, foliis simplicibus petiolatis angusto-lanceolatis utrinque acuminatis serratis, floribus discoideis, calyce exteriore mediocri.

⊙Low, but considerably branched. The leaves all entire, attenuated below into a longish petiole, the smaller branch leaves often nearly entire. The outer calyx small. The flowers without rays and rather small.

Hab. On the margins of ponds in various parts of New England."

Nuttall, Jour. Acad. Nat. Sci. Phila., vii. pt. 1, 99 (1834).

species.[1] This character, however, proves to be very inconstant in *B. connata* and *B. petiolata*, warty or smooth achenes occurring on plants with either type of foliage; and very often the immature achenes of the younger heads are smooth while those of the older heads are distinctly warty. In all these plants the faces of the inner achenes are prominently ribbed making the achenes 4-angled, and the awns are 4 in number, while the 3-angled outer achenes usually have 3 awns. There is, futhermore, great probability that the smooth-fruited American specimens with which recent German botanists have contrasted the warty-fruited *B. connata* are not of this species but are *B. comosa* (Gray) Wiegand (a species which long passed in American collections as *B. connata*), for, as stated by Dr. Warnstorf, in the American plant with which he was contrasting his Neuruppin material "the fruits are always smooth and usually two-awned, only occasionally having a shorter median awn"; while Professor Ascherson, writing to Dr. Robinson in 1898, stated that the so-called *B. connata* examined from America had the outer bracts of the involucre "6–8 or more" and "achenia smooth, ribs less prominent [than in the Neuruppin *B. connata*], awns 2–3"; all of which characters belong to the American *B. comosa* rather than to *B. connata*. The conclusion is, then, that in *B. connata* the presence or absence of warts and the degree of their development are characters which are not concomitant with the marked differences of foliage.

As already noted by Professor Wiegand, the plant with short broad petioles is commoner in New England while the slender-petioled form is more general westward.[2] Yet the plant with three-lobed leaves (typical *B. connata*) has apparently been found in Michigan, for in his Flora of Detroit, Mr. O. A. Farwell, obviously ignoring both Muhlenberg's and Nuttall's descriptions, makes the following singular disposition of the plants.

[1] "Meanwhile, my long-time friend Professor Dr. Ascherson of Berlin, who had become interested in the plant [from Neuruppin, Germany] made an examination of the Berlin Botanical Museum and referred our plant, by Mühlenberg's type specimen, in Willdenow's herbarium under no. 15,021, to *B. connatus*. The matter would have been thereby settled had I not already received from various parts of North America as *B. connatus* an entirely different plant. In this the fruits are always smooth and usually two-awned, only occasionally having a shorter median awn. They are, thus, just like those of *B. tripartitus*. On this account the specimens from the United States heretofore seen by me cannot possibly be identified with Mühlenberg's type in the Willdenow herbarium, but belong to another good species." — Warnstorf, Bot. Gaz. xxv. 48 (1898).

[2] "In New England the leaves are shorter petioled, while in the West the petioles are often very long (1 cm.)" — Wiegand, Bull. Torr. Bot. Cl. xxvi. 415 (1899).

"815. connata, Muhl. Belle Isle, etc. Common and variable: leaves undivided incisely-cut or -serrate (the type); or pinnately three divided with the terminal division petioled,

816. var. petiolata, (Nutt.) (*B. petiolata*, Nutt. Jour. Acad. Philad. 7: 99)." [1]

Nevertheless, in spite of Mr. Farwell's complete reversal of the proper names of the two plants, the name-bringing synonym, *Bidens petiolata* Nutt., must be taken as the basis of the preceding combination and the plant which was so clearly described by Nuttall must stand as the type of the var. *petiolata*.[2]

The two extremes of *Bidens connata* may be distinguished as follows.

BIDENS CONNATA Muhl. in Willd. Sp. iii. 1718 (1804). *B. connata*, var. *petiolata* Farwell, Ann. Rep. Comm. Parks and Boulevards Detroit, xi. 91 (1900) as to plant described, not *B. petiolata* Nutt. At least the primary cauline leaves three-lobed, the two lateral oblong lobes broad-based and conspicuously decurrent to the broadly margined petiole; the uppermost and rameal leaves usually unlobed, subsessile or with short margined petiole.— On shores and in swamps, Quebec to Massachusetts and Michigan and doubtless southward. Less common westward than

Var. PETIOLATA (Nutt.) Farwell, Ann. Rep. Comm. Parks and Boulevards Detroit, xi. 91 (1900) as to name-bringing synonym but not as to plant described. *B. petiolata* Nutt. Jour. Acad. Nat. Sci. Phila. vii. pt. 1, 99 (1834). All or nearly all the leaves unlobed, tapering to slender or narrowly margined petioles.— Common from Maine to Minnesota and Kansas.

BIDENS TRIPARTITA L.

As already noted, the discovery at several stations in Europe of the American *Bidens connata* has given rise to considerable discussion among European botanists, and since it was first called to notice many additional stations have been reported. It is, therefore, interesting to record the occurrence in North America of the European *B. tripartita* L. of which *B. connata* Muhl., *B. frondosa* L., and *B. vulgata* Greene are the common American representatives.

In August, 1904, while visi ing Percé, Gaspé Co., Quebec, with

[1] Farwell, Ann. Rep. Comm. Parks and Boulevards Detroit, xi. 91 (1900).

[2] There is a slight possibility that *Bidens tripartita* L., var. ? *fallax* Warnstorf, Verhandl. bot. Vereins für Brandenburg, xxi. 157 (1879), is the same as *B. connata*, var. *petiolata*, for Warnstorf describes it with "meistens ungetheilten Stengelblätter"; but he later (Bot. Gaz. xxv. 58) states that his plant matches Muhlenberg's type of *B. connata* in the Willdenow herbarium.

Professor J. F. Collins and Dr. A. S. Pease, the writer came upon a colony of *Bidens tripartita* in damp hollows of an Arbor Vitae (*Thuja*) swamp. The plant, which was quite new to him, suggested in some ways all three of its American allies, *B. frondosa*, *B. vulgata* and *B. connata*. Its simple leaves are on margined petioles and are variously cut, mostly into 3 or 5 coarsely toothed segments; thus differing from those of *B. frondosa* and *B. vulgata* which have the 3- or 5-foliolate leaves on marginless petioles, the terminal leaflet usually being distinctly petiolulate. From *B. connata*, the foliage of which more nearly approaches that of *B. tripartita*, it is quickly distinguished by its flattish smooth 2–3-awned achene and the conspicuously ciliate foliaceous outer bracts of the involucre.

When *Bidens tripartita* was found at Percé the writer, not knowing what it was, took it without question for an indigenous plant. It was growing with native species in a partly cleared swamp not far, however, from the telegraph-road which passes through the village. It has been seen nowhere else in the Gaspé Peninsula and it is possible that it may have been introduced from Europe, but its occurrence only in the swamp and not about the village or the wharves points to its probable indigenous character. In this connection it is noteworthy that the clearly indigenous flora of the Percé region — that of the mountain-crests, woods and primative swamps — contains many species common in northern Europe but rare or unknown in temperate America except about the Gulf of St. Lawrence. Among such plants may be mentioned *Catabrosa aquatica* (L.) Beauv., typical *Glyceria fluitans* (L.) R. Br., *Poa alpina* L., *Scirpus rufus* (Huds.) Schrad., *Thalictrum alpinum* L., *Draba incana* L. (true), *Drosera anglica* Huds., *Pleurogyne rotata* (L.) Griseb., *Lappula deflexa* (Wahlenb.) Garcke, *Euphrasia arctica* Lange, *E. borealis* Towns., and *Rhinanthus stenophyllus* (Schur) Schinz & Thellung. It is probable, then, that *Bidens tripartita*, like the foregoing plants of northern Europe, is indigenous in the Gaspé Peninsula and that further search will show it to occur elsewhere than in the single swamp at Percé.

Bidens hyperborea Greene.

Another *Bidens* of the Gaspé Peninsula which in some of its characters suggests *B. tripartita* and *B. comosa* is a little plant which occurs in great abundance at the estuaries of rivers, where it is completely

submerged at high tide. In its leaves and involucre the plant might pass as a dwarf halophytic variant of *B. comosa*, but it has conspicuously striate 4-awned achenes more suggestive of those of *B. cernua*. From dwarf forms of the latter species, however, it is clearly distinct in its petioled or merely sessile entire or remotely dentate leaves, its ellipsoid-campanulate heads, the few (2–4) very long ascending foliaceous bracts, and the flattish, not 4-angled, achene. The writer, after studying the descriptions of recently proposed species of *Bidens*, could find only one description, that of *B. hyperborea* Greene from Rupert House, James Bay, which closely approached the Gaspé plant. In many points Professor Greene's diagnosis scarcely fitted the more eastern plant, so that the writer applied to Professor John Macoun for an opportunity to examine the type of *B. hyperborea* which is in the Herbarium of the Geological Survey Department at Ottawa. This original material which Professor Macoun generously loaned the writer is a sheet of three small plants which, as stated by Professor Greene, are quite simple and monocephalous, thus differing from the Gaspé material which is usually freely branched with very numerous heads. The Rupert House plants, furthermore, have shorter outer bracts than most of the Gaspé specimens. Except for these discrepancies the two plants are essentially alike,— in their foliage, corollas, chaff, and achenes identical. The more abundant collections from eastern Quebec add much to our knowledge of the plant, however, and that it may be more readily recognized by others who find it the following description, somewhat amplifying the original account of the species, is given.

BIDENS HYPERBOREA Greene, Pittonia, iv. 257 (1901). Stems 5–25 cm. high, simple, or more often slightly to freely branched, erect or depressed and matted, glabrous: leaves rather fleshy, narrowly spatulate to oblanceolate, 1.5–6.5 cm. long, 3–9 mm. broad, entire or remotely 2–4-dentate, obtuse at tip, narrowed to a sessile or short-petioled base: heads ellipsoid-campanulate, the involucre 5–10 mm. in diameter; outer bracts 2–4, strongly ascending, foliaceous, 2–6 cm. long: inner bracts 8–12, narrowly oblong, obtuse or subacute, yellow, with dark striations: chaff similar, about equaling the awns: ligules (when developed) narrowly obovate to oblong, 4–6 mm. long, deep yellow: disk-corollas funnelform, about equaling the awns; the 4 short ascending blunt teeth exceeding the purple anthers: achenes linear-cuneiform, 7 mm. long, 1.8 mm. broad at the rounded summit, flattish, about 15-ribbed on each face; the midrib scarcely thickened; the margins (and sometimes the midribs) retrorsely barbed:

awns 4, straight, retrorsely barbed, the 2 pairs unequal, the longer about 3 mm. long.— Originally described from Rupert House, James Bay. Found in August, 1904, on brackish or saline shores, submerged at high tide, near the mouths of the Bonaventure, the St. John (or Douglastown) and the Dartmouth Rivers, QUEBEC.

GRAY HERBARIUM.

FURTHER NOTES ON THE BUTTON-BUSH.

WALTER DEANE.

IN the December number of RHODORA for 1902 (iv. 243–4) I published an account of the persistence of the Button-bush on the farm of Mr. Augustus E. Philbrook of Shelburne, New Hampshire. The place where it grew had been drained and the bushes, though buried under three feet of sand and loam, had persisted in pushing their way up to the light, and for thirty-seven years had flourished, flowering in profusion in their most unnatural quarters, despite the fact that the space in which they grew had long been enclosed and used as a yard for pigs and hens. Notwithstanding the treatment that the Button-bush received, it grew as if unconscious of its changed surroundings.

I have visited Philbrook Farm every year since 1902 and have watched with interest the struggle for existence of my plants. Though at the time when I wrote the article I thought that there was no limit to their life, I was soon aware that each year the number of living stems was diminishing with considerable rapidity. This was apparently due wholly to the fact that the plants were being entirely denuded of their bark at the base, owing to the too great familiarity of their porcine companions.

In 1907 feeling that the little colony was playing a losing game, I had a small space of between three and four square meters enclosed in one corner of the yard.

This was done through the kindness of Mr. Philbrook who has been much interested in this singular case from the beginning. The enclosed space included the most flourishing part of the Button-bush and removed it from all noxious influences. But few plants outside the enclosure showed any signs of life.

In October of the present year, 1908, the status was as follows. In my small preserve five stems were alive — they had produced an abundance of flowers during the summer, but no fruit had set. Everything outside the protected part had been cut down to make way for improvements. This included but two or three living plants. The future is I think very uncertain as the bark of the five survivors has been so roughly handled that they may not long survive. However they have lived already for forty-three years under the most disadvantageous conditions and I trust that I shall yet see the old veterans with their many scars for some years longer.

CAMBRIDGE, MASSACHUSETTS.

NOTES FROM MANCHESTER, NEW HAMPSHIRE.— Some years ago the writer received from a friend in Andover, N. H., a few specimens of *Subularia aquatica* L. These were placed as rarities in the herbarium of our local Institute. In 1906, while hunting for shore plants at Lake Massabesic, a sheet of water 2500 acres in extent, which supplies the city of Manchester, there were found a few plants of this very local crucifer which had been driven by the south wind upon Severance's beach, a long stretch of fine white "scouring sand" on the north shore, in the town of Auburn. In October, 1907, the lake being unusually low, more of the bottom was exposed, and the plants were found in great abundance. This year (1908) the extraordinary drought has reduced the level still more, the surface being 2 ft. below the dam at the outlet, and about 5 ft. below the level of the lake when full, so that a much larger area of sand is exposed. There was found (Oct. 8) to be an almost continuous belt of the plants, from 2 ft. to 2 rods wide, the greater part immersed, extending a distance of not less than 1500 ft. A square foot of sand, measured off where the plants were sown thickest, contained, by actual count, more than 100 plants. There is evidently no immediate danger of the species being exterminated at this station.

The following extensions of the known range of certain species may be of interest. Specimens of all the plants named have been sent to the Gray Herbarium. In 1906 *Eleocharis diandra* C. Wright was found on the sandy shore of Merrimack River. When the station was revisited this season there were also found *Scirpus americanus* Pers. and *S. debilis* Pursh. In the same locality with the *Subularia*

at Lake Massabesic, near the high water level, were found more of the *Scirpus americanus*, and also a station of *S. Smithii* Gray. Close by the last named, growing in a dense mat, was a large colony of *Ilysanthes anagallidea* (Michx.) Robinson. The plants were mostly less than 8 cm. high, some in fruit being barely 2 cm. high,— all very different in aspect from *I. dubia* (L.) Barnhart, which is common in this vicinity. — F. W. Batchelder, *Manchester, New Hampshire.*

A Grass New to Eastern Canada.— This summer (1908) I found *Melica Smithii* (Porter) Vasey, to be a common grass on top of limestone cliffs and among talus at their base on the east shore of the Bruce Peninsula, Ontario. I first collected it at Colpoy's Bay, Ont., on June 21st. Dr. Theo. Holm to whom I sent specimens confirmed my determination. Isle Royal, Michigan, is apparently the furthest east from which it has been previously recorded. In Canada it has been reported only from British Columbia.— A. B. Klugh, Botanical Dept., Queen's Univ., Kingston, Canada.

A RIBES NEW TO MASSACHUSETTS.

Stewart H. Burnham.

During the ascent of Mt. Greylock by the carriage road from North Adams, 4 July, 1908, at about 3000 feet and approximately a mile from the summit I collected a few branches from a reclining shrub, specimens of which are deposited in the Gray Herbarium. Prof. M. L. Fernald in his letter of September 18th says: "It is *Ribes triste* Pallas, var. *albinervium* (Michx.) Fernald, Rhodora 9:4. Jan. 1907. The shrub is very common in coniferous forests and on the mountains of northern New England and eastern Canada but has not been recorded from Massachusetts. It is interesting to note that your plant from the schistose upper area of Mt. Greylock is the variety, which is also the characteristic plant of the other mica-schist, granite and gneiss mountains northward; while typical *R. triste* is in my experience best developed in strongly limy soils."

Ribes lacustre (Pers.) Poir and *R. prostratum* L'Hér. were collected

on this excursion; the latter being the common species on the mountain. *Lycopodium clavatum monostachyon* Grev. & Hook. was found along the roadside in the Notch. *Milium effusum* L., *Luzula parviflora* (Ehrh.) Desv., *Amelanchier oligocarpa* (Michx.) Roem. and *Rubus Canadensis* L. were also found near the summit of the mountain. The flora of Mt. Greylock, although 3505 feet above sea level, is poorer in mountain plants than one would expect: but the lichen flora is very rich, especially in those species found on the trunks of balsam fir, mountain ash, birch and other hardwood trees.

GEOLOGICAL HALL, Albany, N. Y.

STELLARIA AQUATICA IN VERMONT.— In a note on the preliminary list of the Caryophyllaceae of New England, RHODORA V. 190, it is stated that "the sole basis for the report *Stellaria aquatica* Scop. in New England is a single but unmistakable specimen collected near the Boston & Albany Railway at Newtonville, Mass., July 28, 1881, by C. J. Sprague." I can report another and more prolific station located in southwestern Vermont at North Pownal. This station, also, is near a railway, the Boston & Maine, and extends along both banks of the Hoosac river for a mile or more. I collected the species here Sept. 17, 1907. It occurs in alluvial soil, in partial shade, and is very abundant in places. The Stellarias from this locality are remarkable for their length. I measured several whose main stems were over two meters long and saw others which I estimated to be even longer. As they branch freely, they may extend nearly an equal distance laterally, and a single plant can, under favorable conditions, spread out over a considerable area. Specimens have been deposited in the Gray Herbarium and in the Herbarium of the University of Vermont.— R. W. WOODWARD, New Haven, Connecticut.

THE TEXT-FIGURES IN GRAY'S NEW MANUAL OF BOTANY.

AGNES CHASE.

Two reviews of Gray's Manual of Botany, Seventh Edition, have recently appeared in Science and in RHODORA respectively. Both reviewers have mentioned that there are numerous illustrations, but neither has bestowed on these illustrations the attention they merit. They are not merely figures of uniform size, so many to the page, but are faithful and beautifully executed representations of important specific characters. When in the old days we pored over the Carex keys until we almost knew them by heart, we were often hard put to it to decide whether the perigynium in hand should go under "Beakless" or "Beaked," or whether the puzzling specimen in Ovales had a "Perigynium ovate-lanceolate with winged margins" or one "ovate-lanceolate or narrower, scale-like, with little distinction between body and margin," or "Spikes spreading or drooping" or "Spikes erect," trying first the one division, then the other. Here these very points are shown in the figures, and beak and teeth and wings, that almost defy description in words, stand forth in characteristic form. The keys show the most painstaking work, but to make a perfect key is beyond the power of any human being, since Nature does not divide her species dichotomously. An accurate figure of the typical form, then, becomes of the greatest value.

The figures of Aster and of Desmodium serve as further examples of the fidelity of the drawings and their usefulness in identification of species, illustrating in the former the involucral bracts and the jointed pods in the latter. In like manner are the various diagnostic characters of the different genera brought out. Magnified cross-sections of the stem and portions of the epidermis are figured in Equisetum, the achenes in Sagittaria, flowers in *Orchidaceae*, the fruiting calyx in Rumex, pods and leaves in most of the *Cruciferae*, but rootstocks in Dentaria, fruit and cross-section of it in *Umbelliferae*, inflorescence and magnified flowers in *Labiatae*, the very distinct capsules of the commonly confused *Plantago major* and *P. Rugelii*, and so throughout all the genera which are illustrated.

The fidelity of the artist's work to the plant before him is shown in the figure of the grotesque achene of *Carex Tuckermanii* Dewey,

which is nowhere, not even here, described in print. This strikingly characteristic achene years ago led some of us to think that our specimens of this Carex must belong to a new species because such an achene was nowhere described, but examination of specimens of *C. Tuckermanii* revealed the fact that this queer achene was characteristic of that species.

There are 1036 figures in all, and each is a work of both science and art.

WASHINGTON, D. C.

HEDEOMA HISPIDA IN CONNECTICUT.— During the recent meeting of the Connecticut Botanical Society at Putnam, Connecticut, I was fortunate enough to discover a quantity of *Hedeoma hispida* Pursh. growing near the Quinebaug River. Although the individual plants were mostly small (5–10 cm. tall), they could be gathered by the handful over an area of an acre or more. The station is in open ground and the soil is a sandy alluvium on the flood-plain of the river, thus offering conditions in some measure similar to those in the native habitat of the plant on the western plains. The woolen mills of the town suggest themselves as the means of its introduction. This seems to be the first record of the species in Connecticut but Mr. W. W. Eggleston has reported its occurrence in Vermont (RHODORA 6:142) and Mr. C. A. Weatherby informs me that there is in the herbarium of the New England Botanical Club a specimen of the same plant collected at Reading, Massachusetts, in 1887 by W. H. Manning and described by him as "a weed in gardens." — E. B. HARGER, Oxford, Connecticut.

Vol. 10, no. 118, including pages 173 to 196, was issued 9 November, 1908.

Rhodora

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IN MEMORIAM: ALVAH AUGUSTUS EATON

R. G. Leavitt.

It is already known to many readers of this journal that Alvah A. Eaton died at his home in North Easton, September 29th, after long suffering endured with heroic courage. Mr. Eaton's publications had made his name widely known. With a considerable number of American students of plants, especially students of ferns and fern-allies, he had formed relations of friendly and professional intercourse. He had been very active as a collector in the region of his residence, in which he had brought to light many plants of interest, including some that were new to science. From his excursions to little explored districts of Florida he had brought back valuable collections of orchids, ferns, and woody plants. He possessed a remarkable talent for finding things of interest and importance, however well concealed from ordinary eyes they might be, which, combined with activity, willingness to penetrate dangerous parts, and persistence in the face of difficulty, made him a very useful contributor to the progress of botanical science. Such men as he was can ill be spared.

Beyond the memorial of appreciation due to everyone who has given his life in devotion to the work which has lain before him, those who were during several years his associates in common tasks wish to express their admiration for Mr. Eaton's many excellent qualities as a man. His sincerity was perfect; every call made upon him for effort was accepted with eager responsiveness; his courage to face any difficult situation, danger to life, or bodily anguish, was of the finest quality.

The writer first became acquainted with him some seven years ago through an inquiry after certain aquatic plants in which Mr. Eaton

was expert. An invitation to the writer to visit Seabrook, N. H., followed. Upon the ensuing excursion to the Powow River and two subsequent trips along the Merrimac, Mr. Eaton's remarkable knowledge of habitats became clear. His transference to North Easton seemed not to disturb his accurate feeling for localities in which plants should be found, an instinct born of long and close familiarity with nature, and amounting oftentimes — so to the onlooker it seemed — to clairvoyant power. This apparent prescience and very remarkable vision distinguished Mr. Eaton among collectors of plants. His eye exhausted the details of the field at once, and picked out the smallest objects of search at distances which baffle any but the strongest sight. Walking rapidly along the roadside he would suddenly retrace his steps a little and out of the grass bring forth some small growth altogether beneath the range of the ordinary trained observer. This keenness was in part a gift, as regards optical perfection, partly the result of self-training in concentration and alertness of mind.

For, finally, this is to be said in honor of Mr. Eaton as a man of science, that he achieved what he achieved by his own efforts, unaided, and often against the force of circumstances. With only a high school education — received at Newburyport and accomplished in half the time usually required — he familiarized himself with much in the results of modern science, mastered French, German, and Latin sufficiently for his needs in taxonomy, mastered the local flora thoroughly and the fauna extensively, and above all won a position of authority in the study of two or three groups of particularly difficult plants. Most of this was done while he was supporting himself by work on a farm. Few men would have overcome the influence of poor health, lack of means, and varied discouragements as he did.

He left two unpublished papers of considerable length, one a study in the family *Orchidaceae*, already announced; the other his most important contribution to science, a monograph of North American Isoëtes, the result of many years of study, revised not long before his final illness.

His friends will be glad to know that in the closing weeks of his life, after it had become certain that he could not live, not only did he show a calmness and fearlessness, the fruition of a sincerely good life, but he was able — such was the strength of his nature — to feel in spite of pain much of peaceful enjoyment of his home and of the outdoors world. He said that the view from his tent door out across the mead-

ows to the trees beyond was as beautiful to him as anything on earth could be; and in a letter written shortly before death he said that he had been moved into the front room of his house — "the pleasantest room in the world." During the entire last period, after the surgeon's knife had, vainly, done its work and his bodily strength had gone, the real nature of the man shone out, noble and ennobling.

STATE NORMAL SCHOOL, Trenton, New Jersey.

BOTANICAL WRITINGS OF THE LATE ALVAH AUGUSTUS EATON.

M. A. DAY.

[Feeling that a list of Mr. Eaton's botanical writings would be both a respectful tribute to his memory and an aid to students of American botany, Miss Day, librarian of the Gray Herbarium, has at our request kindly prepared the following bibliography to accompany Dr. Leavitt's sketch. It is due to Miss Day to state that the compilation was necessarily hurried, but it is believed that it includes all Mr. Eaton's more important published contributions to botany and most if not all his minor notes. It is possible that some of the latter have appeared in local journals and have escaped mention. As Dr. Leavitt's notice has taken the form of an appreciation of Mr. Eaton's character and work, rather than an account of his life, it seems desirable to record here the following biographical data:— Alvah Augustus Eaton was born November 20, 1865, at Seabrook, New Hampshire. In 1898, he was elected Secretary of the Linnaean Fern Chapter, and in the following year chosen president of the same society. December 5, 1902, he was made a non-resident member of the New England Botanical Club. In September, 1904, he married Constance E. Wilkins. For about six years at the close of his life Mr. Eaton was officially connected with the Ames Botanical Laboratory at North Easton, Massachusetts, where he was engaged chiefly in monographic, bibliographic, determinative, and field work of a taxonomic nature. He is survived by his widow and only child, Fred W. Eaton.—Ed.]

1. OPHIOGLOSSUM VULGATUM. Fern Bull. iv. 60–61, fig. 1896.

2. LYCOPODIUM ALOPECUROIDES IN MASSACHUSETTS. Fern Bull. v. 3–5. 1897.

3. TWO ODD OPHIOGLOSSUMS. Fern Bull. v. 11. 1897.

4. A NEW QUILLWORT FROM MEXICO. Fern Bull. v. 25–26. 1897.

5. GET IT IN YOUR EYE. Fern Bull. v. 29. 1897.

6. A NEW CHEILANTHES OF THE SECTION ADIANTOPSIS. Fern Bull. v. 43–45. 1897.

7. [NOTE ON OSMUNDA CINNAMOMEA FRONDOSA.] Fern Bull. v. 65. 1897.

8. [NOTE ON PRESERVING EQUISETUM.] Fern Bull. v. 66. 1897.

9. [NOTE ON BOTRYCHIUM TERNATUM WITH TWO FERTILE FRONDS.] Fern Bull. v. 66. 1897.

10. A NEW ISOËTES. Fern Bull. vi. 5–7. 1898.

11. ISOËTES MINIMA N. SP. Fern Bull. vi. 30. 1898.

12. TWO NEW SPECIES. Bull. Torr. Bot. Club, xxv. 338–341. 1898.

13. THE GENUS EQUISETUM, WITH REFERENCE TO THE NORTH AMERICAN SPECIES. Fern Bull. vi. 45–49, 69–71. 1898; vii. 57–59, 85–88. 1899; viii. 75–78. 1900; ix. 3–4, 33–37, 61–63, 81–84. 1901; x. 43–45, 71–74. 1902; xi. 7–12, 40–44, 73–75, 108–114. 1903; xii. 23–25, 39–43. 1904.

In this series of papers numbers 10 to 17 bear the title THE GENUS EQUISETUM IN NORTH AMERICA.

14. NOTES ON A PECULIAR BOTRYCHIUM. Linnaean Fern Chapter (Boston Meeting), 25–30. 1899.

15. A NEW SPECIES OF BOTRYCHIUM. Fern Bull. vii. 7–8. 1899.

16. FERN VARIATION. Fern Bull. vii. 12–13. 1899.

17. A NEW SPECIES OF SELAGINELLA. Fern Bull. vii. 33–34. 1899.

18. TWO NEW ISOËTES. Fern Bull. viii. 12–14. 1900.

19. [NOTE ON FINDING BOTRYCHIUM SIMPLEX.] Fern Bull. viii. 19. 1900.

20. ISOËTES HOWELLII AND ISOËTES NUTTALLI[I]. Fern Bull. viii. 32–33. 1900.

21. PARIETARIA DEBILIS IN NEW HAMPSHIRE. Rhodora, ii. 158. 1900.

22. A NEW VARIETY OF ISOËTES. Fern Bull. viii. 60–61. 1900.

23. A FEW ADDITIONS TO THE NEW HAMPSHIRE FLORA. Rhodora, ii. 167–168. 1900.

24. The genus Isoëtes in New England. Fernwort Papers, 1–16. 1900.

25. A new variety of Dryopteris munita. Fern Bull. ix. 7–8. 1901.

26. Our western Woodwardia. Fern Bull. ix. 86–87. 1901.

27. The earliest fern. Fern Bull. ix. 91. 1901.

28. Specific characters in Botrychium tenebrosum. Fern Bull. x. 54–56. 1902.

29. A new form of Nephrodium Thelypteris. Fern Bull. x. 78. 1902.

30. A new Equisetum. Fern Bull. x. 120–122. 1902.

31. An interesting form of Leersia oryzoides. Rhodora, v. 118. 1903.

32. Isoëtes riparia canadensis and Isoëtes Dodgei. Bull. Torr. Bot. Club, xxx. 359–362. 1903.

33. Additional notes on Botrychium tenebrosum. Rhodora, v. 274–276, pl. 48. 1903.

34. Three new varieties of Isoëtes. Rhodora, v. 277–280. 1903.

35. Dodge's fern. Am. Bot. v. 117. 1904. Reprinted in Fern Bull. xii. 57. 1904.

36. Note on Equisetum pratense. Rhodora, vi. 92. 1904.

37. Preliminary list of Pteridophyta collected in Dade County, Florida, during November and December, 1903. Fern Bull. xii. 45–48. 1904.

38. A correction Fern Bull. xii. 70. 1904.

39. The California gold fern. Fern Bull. xii. 77–78. 1904.

40. Is Asplenium lanceum American? Fern Bull. xii. 79–80. 1904.

41. Isoëtes Amesii: a correction. Fern Bull. xii. 89. 1904.

42. Pellaea Ornithopus. Fern Bull. xii. 113–114. 1904.

43. Notes on Isoëtes. Fern Bull. xiii. 51–53. 1905.

44. Botrychium biternatum Underw. Fern Bull. xiii. 87. 1905.

45. Pteridophytes observed during three excursions into southern Florida. Bull. Torr. Bot. Club, xxxiii. 455–486. 1906.

46. Nomenclatorial studies in three orchid genera. Proc. Biol. Soc. Wash. xxi. 63–67. 1908.

47. Nomenclatorial changes in Isoëtes. Rhodora, x. 42. 1908.

48. ISOËTACEAE. In Flora of the Boston District, II. Rhodora, x. 61–62. 1908.

49. OSTRICH FERN, VAR. PUBESCENS. Fern Bull. xvi. 47–48. 1908.

50. A QUESTION OF NOMENCLATURE. Fern Bull. xvi. 77–79. 1908.

51. EQUISETACEAE. In Gray's New Manual of Botany, Seventh Edition, 51–54. 1908.

52. ISOËTACEAE. In Gray's New Manual of Botany, Seventh Edition, 58–62. 1908.

Articles relating to Mr. Eaton's herbarium and work.

[NOTES ON WORK OF MR. EATON.] Fern Bull. v. 33. 1897.

THE HERBARIUM OF MR. A. A. EATON. Rhodora, iii. 221. 1901.

ALVAH AUGUSTUS EATON. By W. N. Clute. Fern Bull. x. 52–53. 1902, with portrait.

MORE TERATOLOGICAL FORMS OF TRILLIUM UNDULATUM.

WALTER DEANE.

I HAVE recently received, through the kindness of Mr. Edwin DeMeritte, some more examples of teratology in our common Painted Trillium (*Trillium undulatum* Willd.) from Holderness, New Hampshire. A specimen of this species, illustrating this curious modification, was collected in August, 1907, by Mr. DeMeritte, in the same locality, and it formed the basis of an article, which I published some months ago (RHODORA, x. 21–24). The locality, as I described before, is on the shore of Squam Lake "in the leaf-mould and scanty soil on a rocky ridge" near the water.

It was in early July that Mr. DeMeritte visited and collected the plant for the second time. On the very same spot as before, and one stem at least evidently from the same rootstock as the plant of 1907, there were five stalks growing in a close cluster, three of them with three whorls of three leaves each, one with two whorls of three leaves

each, and one with four whorls of three leaves. Two of these specimens were collected. It is significant that the plan of three was followed each year. About two meters from this spot was a single stalk with one whorl of four leaves. This specimen was also taken and the three plants were pressed and given to me for study. Perfectly normal types grew in abundance near by. It was intended to revisit the station while the plants were still in flower, but this was impossible. The fruit in my specimens was beginning to develop and the petals were withered. The persistency, however, of the stamens as well as the petals in Trillium has enabled me to make an accurate examination of the floral envelopes.

I will now describe the three specimens. There is one bearing two whorls of three leaves each, the leaves all taper-pointed and those of the lowest whorl broadly ovate with petioles, 2.5 cm. long. The blades are respectively 16 cm., 14 cm., and 14.5 cm. in length. The internode above is 2.5 cm. long. The leaves of the next whorl are broadly ovate with petioles, 1 cm. long. The blades are 11 cm., 13 cm., and 12.5 cm. in length. Above this is the flower with a peduncle, 5.5 cm. long. The sepals are ovate, taper-pointed, sessile, and of extraordinary size, being 4 cm. wide and 9 cm. long. Indeed they resemble typical leaves. There are four petals of normal shape in this specimen, alternating with the sepals, two of the petals being contiguous and doubtless the result of chorisis. These replace the third petal normally present. There are but three stamens, one at the base of each of three of the petals, and all normal. The ovary has two main styles, the division between them extending to the base, one of the styles being cleft half way down, thus making three styles in all. The ovary is one-celled with two parietal placentae, bearing respectively 5 and 3 developing ovules.

This specimen is probably from the same stock as the one of 1907. Closely contiguous to it is the second stalk which has three whorls of three leaves each, all taper-pointed. In the lowest whorl the petioles are 7 cm. long. The blades of two of the leaves have been destroyed, but the third is present and is broadly ovate and 13.5 cm. long. The internode above is 7.5 cm. in length. In the next whorl one leaf is gone, the scar showing its position. The remaining two have petioles 2.5 cm. long and blades 12 cm. in length. The next internode is 4.5 cm. long and the leaves in the third and uppermost whorl are sessile and 10.3 cm., 10 cm., and 11 cm. in length respectively. The peduncle is 1.5 cm. long and there are three large sepals, 5 cm. long,

each with a normal stamen at the base. The three petals, which are also normal, are persistent and withered and have no stamens opposite them. It will be noticed that in this flower it is the outer row of stamens that were developed, whereas in the former flower it was the inner row (those opposite the petals). The ovary has three styles and is one-celled with three parietal placentae, and contains many ovules as yet undeveloped.

The third specimen, which, as I stated above, was growing about two meters from those just described, has a single whorl of four leaves at the top of the stem, broadly ovate and taper-pointed. Three of them have normal petioles 1 cm. long and blades 15 cm., 15 cm., and 14 cm. in length respectively. The fourth leaf has a broadly winged petiole 1 cm. long and blade 15.5 cm. in length. The peduncle is 4.5 cm. long and there are four sepals of normal size 3 cm. long, each with a typical stamen at the base. Three petals only, normal, each with a typical stamen at its base, are present. The ovary has four styles and was plainly four-celled, the partitions separating three of the cells having been broken away by the enlarging ovules, one of the cells being intact. The ovary was filled with forty-six well developing ovules that bade fair to be good seeds. These three specimens with the dissected parts are in my herbarium.

Mr. C. H. Knowlton has kindly sent to me for examination an abnormal *Trillium undulatum*, collected by him in July, 1897, at Farmington, Maine. The plant is just past the flowering stage. A single whorl of four leaves crowns the top of the stem. They are perfectly normal in shape and from 7.5 cm. to 9 cm. in length. The peduncle, two sepals, and three petals are normal, one sepal having evidently been destroyed by an insect. There are six stamens, five of them typical and one more or less petaloid and occupying the place opposite the missing sepal. The ovary has three styles and is one-celled with three parietal placentae, the cell well filled with ovules.

Teratological forms of Trillium seem to be unusually vigorous, and two at least of the specimens that I have just described would evidently have set well developed fruit. I draw no deductions from these statements, but think it best to put on record facts for future specialists.

CAMBRIDGE, MASSACHUSETTS.

A Bulletin on Shade Trees, a publication in which the Massachusetts Forestry Association and the Agricultural Experiment Station have co-operated, has been recently issued and will meet a long felt want. Every one loves trees and much time and money are spent in planting and caring for them. The results are not infrequently disappointing on account of injudicious selection, wrong methods in setting, or improper or insufficient care. This bulletin gives the substance of the laws pertaining to shade trees and tree wardens, and discusses the duties of the latter. The selection of varieties suited to different localities is considered. Statistics showing the rate of growth of different trees, together with directions for setting, transplanting, and pruning, are given. Methods of preventing or repairing damages to trees receive attention, and such topics as chaining and bolting, treating decayed cavities, filling, etc., are fully discussed. Injuries to trees due to leaky gas mains, contact with electric wires, and other electrical injuries are considered and the best methods of prevention described. The concluding section of the bulletin gives descriptions of the more serious insect enemies and explicit directions for destroying them or preventing their injuries. This bulletin will be sent to members of the Massachusetts Forestry Association, to tree wardens in all parts of the state, and to public librarians. Other persons desiring copies should write to the Massachusetts Agricultural Experiment Station, Amherst, Mass.

New England Botanical Club, Annual Meeting.— At the annual meeting of the New England Botanical Club held at 3 Joy Street, Boston, on the evening of December 4th, 1908, the Phaenogamic Curator reported the gift to the Club by Miss Kate Furbish of Brunswick, Maine, of her extensive herbarium of Maine plants. The forming of this collection has been one of Miss Furbish's chief interests for the past forty years. It is, therefore, especially valuable as the pioneer collection of flowering plants and ferns from many sections of Maine which have not been visited by other botanists. Altogether the floras of more than two hundred towns and villages are represented; and when the material has been worked over it is expected that fully 10,000 specimens will be added to the organized collections of the Club, and that many of the species will be additions to the recorded flora of Maine.

Officers of the Club for the ensuing year were elected as follows: President, Walter Deane; Vice-President, Fred Dayton Lambert; Corresponding Secretary, Edward Lothrop Rand; Recording Secretary and Treasurer, Emile Francis Williams; Phaenogamic Curator, Merritt Lyndon Fernald; Cryptogamic Curator, Hollis Webster; Members of the Council, George Golding Kennedy, Clarence Hinckley Knowlton, Benjamin Lincoln Robinson.

The following gentlemen were elected to membership in the Club: Austin Walter Cheever, Mattapan, Massachusetts; Herbert Spencer Jackson, Cambridge, Massachusetts; and George Elwood Nichols, New Haven, Connecticut.

ERRATA.

Page 12, line 18; for *Ur dinaceae* read *Uridinaceae*.
" 16, " 1; " *articum* read *arcticum*.
" 32, " 17; " **sphaerocarpum** read **sphaerocarpa**.
" 33, " 30; " *orobioides* read *oroboides*.
" 35, " 7; omit second *rigida*.
" 46, " 22; for POTAMAGETON *read* POTAMOGETON.
" 67, " 3; " *S. gratioloides* read *I. gratioloides*.
" 146, " 32; " *cephaloides* read *cephaloidea*.
" 148, last line; for *116* read *115*.
" 151, line 31; for *glycphyllos* read *glycyphyllos*.
" 162, " 27; " than *read* that.
" 172, last line; for *117* read *116*.
Pages 179, 181, and 183, in the page-heading; for Lists of Connecticut *read* Lists of Connecticut Diatoms.
Page 184, line 38; for *mesostyla* read *mesotyla*.

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New scientific names are printed in full face type.

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